

**AWARENESS OF BREAST CANCER RISK FACTORS AND SCREENING PRACTICES
AMONG FEMALE COMMUNITY HEALTH WORKERS IN KIGALI, RWANDA:
A CROSS SECTIONAL STUDY**

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BY

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DECLARATION

I Felix MULINDANGABO, hereby declare that except for the references duly acknowledged, the work presented in this dissertation is my original work and has not been presented for any award of a degree in any University/Institution.

Signature;.....Date;.....

(Principal Investigator)

This work has been done under the supervision and submitted with the approval of my Supervisors;

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DEDICATION

This work is dedicated to my lovely wife Justine KOBUSINGE, her support and encouragements have influenced the individual I have become and the accomplishments I have obtained. Without her love, support, understanding, strength, and personal sacrifice, I would not have completed this journey.

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LIST OF SYMBOLS AND ABBREVIATIONS

BSE	Breast Self Examination
BHGI	Health Global Initiative
CBE	Clinicat Breast Examination
CHUB	Centre Hospitalier Universitaire de Butare
CHUK	Centre Hospitalier Universitaire de Kigali
CHWs	Community Health Workers
GLOBOCAN	Global Cancer Database
HPV	Human Papillomavirus
IRB	Institute Review Board
NGOs	Non Governmental Organization
OR	Odds Ratio
RBC	Rwanda Biomedical Center
WHO	World Health Organization

ABSTRACT

Background: Each year, breast cancer is newly diagnosed in more than 1 million women worldwide and more than 400,000 women die from it [102,103]. Breast cancer is a growing public health throughout the world, but especially in developing regions where the incidence has increased as much as 5% per year. [102,104]. In Rwanda, breast cancer is the most occurring cancer among women (28.7%) followed by Cervix uteri cancer (21.3%). Early diagnosis is especially important for breast cancer because the disease responds best to treatment before it has spread. Female community health workers are in good position to encourage and influence women to be breast aware.

Objectives: The study assessed the awareness of the breast cancer risk factor and early detection measures among female community health workers residing in Kigali city.

Methodology: The study used across-sectional design which was carried out in Kigali City from June to November 2016. A total of 405 female community health workers were interviewed using simple random sampling with proportional allocation to size of Districts. Data were collected, entered and analyzed with SPSS 21. Ethical clearance was obtained from College of Medicine and Health Sciences IRB (131/CMHS IRB/2016) to ensure the study adheres to principles of protecting the rights of participants. Thereafter, data were collected, entered and analyzed using SPSS version 21. The awareness of breast cancer risk factors and early detection measures were categorized into poor and good.

Results: The awareness of breast cancer risk factors among female community health workers in Kigali was low was (7.7%). Breast cancer risk awareness was increasingly associated with personal history of breast problem $\chi^2=10.928$, $p<0.005$. The awareness of breast cancer early detection measures among community health workers relatively moderate (19.9%). Awareness was associated with education and occupation of the respondents respectively $\chi^2=7.277$, $p<0.05$ and $\chi^2=9.204$, $P<0.05$. The practice of self breast examination was relatively averaged (44.3%) and it increasing associated with residence (OR=2.569, 95% CI=1.121-5.886) education level (OR=2.133, 95% CI=1.269-3.585), having received breast cancer information from health professional (OR=2.115, 95% CI=1.132-3.951) and having first degree family member with breast cancer history (OR=0.263, 95% CI=0.070-0.986) respectively.

Conclusion:

The awareness of breast cancer risk factors and early detection measures was generally low in female community health workers living and residing in Kigali. Demographics characteristics like residence,

education level, having a first degree relative with breast cancer history and receiving breast cancer information from health profession were statistically associated with the awareness and practice of self breast examination practice. These results provide important baseline information and may be used to develop tailored breast cancer education programs, increase primary and secondary prevention efforts and evaluate the effectiveness of prevention programs.

CHAPTER ONE: INTRODUCTION

1.0. Background

Breast cancer has become a leading cause of death and disability in developing countries. Each year, 55%–60% of all new breast cancer diagnoses and 62%–70% of breast cancer deaths occur in low-and middle-income countries [1, 2, and 3]. Breast cancer is now the leading cause of cancer death among women worldwide and the most frequently diagnosed cancer among women [4] in 140 of 184 countries included in the GLOBOCAN 2012 database.

Breast cancer is the most prevalent cancer in the world being responsible for 10.4% of the global burden [5]. Among Rwandan women, Breast cancer is the first most frequent diagnosed cancer followed by cervical cancer. The 2007-2013 Rwanda Biomedical Center (RBC) report on Cancer Epidemiology indicates that cervical cancer is the second type of cancer in women at 15.6% after breast cancer 15.8% (RBC report, 2013)[6].

In recent years, the ministry of health launched the cervical cancer screening programme to fight against cervical cancer after comprehensive national cervical cancer prevention campaign that was rolled out in 2011 targeting girls aged 11 to 12. Statistics from the Rwanda Ministry of Health indicate that over 227,246 girls were vaccinated with all the three doses of the human papillomavirus (HPV) vaccine. Though Rwanda has intensified awareness on early screening for both cervical and Breast Cancer. It has recorded an increase in breast cancer cases over the last three years. WHO health data indicates that there were 66 cases in 2009, 79 cases were reported; in 2010 and 103 cases of breast cancer were recorded in 2011.

A 2007-2013 Rwanda Biomedical Centre report on cancer epidemiology indicates that 4,615 people were infected with different types of cancers, the most common ones being breast cancer, constituting 15.8%, Cervix uteri standing at 15.6%, while stomach cancer was 9.1% and uterus 5.5%. According to the report, stomach cancer was the most prevalent among men, standing at 11.7%, followed by prostate, at 9.4 per cent. Statistics indicate that more cases of cancer patients were reported at Kigali University Teaching Hospital (CHUK), with 1,768 cases. It was followed by Centre Hospital University Butare (CHUB) which recorded 1,645 cases, while King Faisal Hospital received 1,096 patients.

Breast cancer used to be considered a disease of high-income countries, but findings indicate that about 50% of breast cancer cases and 58% of breast cancer deaths occur in developing nations.[7] There has been a significant increase in the incidence of breast carcinoma in sub-Saharan African countries and in other low-resource countries [8,9]. In comparison to western countries, breast cancer in African women tends to occur in premenopausal women with incidence peaking between the ages of 35 and 45 years [10,11]

Similar to African-American women in the US, breast cancer in African women tend to be the aggressive triple negative subtype [12, 13], which is non-responsive to commonly used therapeutic drugs. Mortality rates for African women are relatively higher when compared to women in Western countries [8, 14]. Unless medical care and screening practices are dramatically improved in Africa, breast cancer mortality rates can be expected to remain disproportionately high [15]. Apart from African women being predisposed to the more aggressive form of breast cancer, the disproportionately greater mortality rate compared to high-resource countries can be attributed to a lack of public awareness of the disease, absence of organized screening programs, delayed presentation and lack of accessible and effective treatment options [16].

As a result of late detection, most patients are diagnosed well after the breast cancer is at an advanced stage and has metastasized to other organs [11]. For example, previous studies have reported that 70-90% of African women present with stage III or IV breast cancer [17, 18]. The advanced stage distribution is partially explained by delayed presentation for medical evaluation, which, according to Anyanwu [19], can be as high as 11 years from the time of self-detected breast abnormality.

While in Western countries, breast cancer screening is usually done using mammograms, the use of mammograms is limited and inaccessible to most women in sub-Saharan Africa. This situation is unlikely to change in the foreseeable future [20]. While Regular clinical breast examination and mammography of women can result in down-staging of breast cancer of asymptomatic women according to the internationally accepted guidelines [21].

In the absence of readily available mammographic screening, despite its known limitations, breast self-examination (BSE) remains a viable and practical alternative for African women [20, 22]. With greater awareness of breast cancer and proper training in BSE combined with regular clinical breast examination, it is possible to diagnose breast cancer earlier. Women who regularly perform BSE become familiar with both the appearance and feel of their breasts which often helps them detect any

changes early. However, if improperly done, BSE has the risk of giving false health security and may actually reduce willingness to undergo mammographic screening even in place where it is readily available [23].

Breast cancer survival rates vary greatly worldwide, ranging from 80% or over in North America, Sweden and Japan to around 60% in middle-income countries and below 40% in low-income countries [24]. While the survival rate of five-year among women with newly diagnosed breast cancer in the United States has reached 89% [25]. However, breast cancer survival rates in low-income countries are estimated to be below 40% [26]. Many advances in breast cancer control in high-income countries like the United States are attributed to attention to disease risk factors and symptoms, advances in early detection, and accessible and effective multimodality treatment.[27] The low survival rates in less developed countries can be explained mainly by the lack of early detection program, resulting in a high proportion of women presenting with late-stage disease, as well as by the lack of adequate diagnosis and treatment facilities.

The majority of breast cancer-affected women from low-income countries like Rwanda present with advanced-stage disease, resulting in limited therapeutic options and persistently high mortality rates. [28] Delays in breast cancer diagnosis and treatment in developing nations are attributed to patient, healthcare provider, and system-mediated barriers to early detection and care. [29]

Breast cancer screening in higher income countries with existing public health and health systems infrastructure is systematic and follows evidence-based guidelines for population-based breast cancer screening and early detection. These guidelines, mainly focuses on mammography and are commensurate with high living standards, and access to quality screening, diagnostic, and treatment services. This is not fully implemented in limited resources countries whereby, population-based breast cancer screening is a complex undertaking due to limited public health infrastructure and fragmented health systems.

The Breast Health Global Initiative recognized these limitations in existing resources and outlined international evidence-based breast health guidelines for low-and middle-income countries, grouping early detection, diagnosis, treatment, and care resource allocation into four categories based on the country's existing services.

Among resources dedicated to breast cancer early detection, the first tier (“basic level”) of this four-tier algorithm included “development of culturally sensitive, linguistically appropriate local educational programs for target populations to teach the value of early detection, breast cancer risk factors, and breast health awareness (education and self-examination).”[30] This basic system of early detection, designed for the most resource-limited nations, is focused on attention to early signs and symptoms of the disease, clinical breast examination (CBE), and timely referral for diagnosis and treatment. As awareness and understanding of breast cancer in Africa remain generally low. In last decade, the World Health Organization and several international organizations such as The Breast Health Global Initiative (BHGI) have launched various initiatives to increase breast cancer awareness among African women [31, 32].

In limited resources setting like Rwanda context, educating the women about the risks of breast cancer constitutes a first step towards early detection of breast cancer, so that women would be able to judge their risk and take relevant measures. The important resources of dissemination of breast cancer knowledge to women are the health-care professionals, educational institutions and media. Among the healthcare professionals, female community health workers comprise the group most suited for this purpose. Community health workers can play an important role in educating women through specially designed educational programs for community outreach strategies that suit community setting. In addition, they constitute an important source of information within their social networks and Community health workers are an integral part of Rwanda healthcare workforce, as in many other low and middle-income countries, and, if properly informed, represent an important and underused resource for raising awareness and earlier detection of breast cancer [33]. Since the community health workers can have a major influence on the behavior of our women, they need to be knowledgeable themselves about breast cancer risk factors and the importance of early detection through screening.

Studies in the developing countries show diverse results ranging from poor to good knowledge about breast cancer. Among the Nigerian health workers, about half were well-informed of at least two out of five risk factors where 55% respondents had very poor knowledge about risk factors for breast cancer and 45.5% showed low knowledge about Breast Self Examination (BSE) as a screening method. [34] A Study conducted in Angola showed a general lack of breast cancer awareness and knowledge among university students irrespective of their gender, marital status, years in university and nature of high school attended [35]. Findings from Tanzanian also revealed that 30% of

Tanzanian women were able to correctly identify breast cancer risk factors while 51% knew about of symptoms [36].

There are no recognized studies that have been conducted in Rwanda to elicit women's knowledge about breast cancer awareness risk factors and its screening practices. The aim of this study is to assess the level of knowledge regarding risk factors, screening practices of breast cancer and evaluate associated factors among female community health workers in Rwanda. The findings of this study are essential in developing an effective and targeted awareness campaign and instill practices habits to prevent delayed presentations of breast cancer.

1.1 Definitions of key concepts

Definition

Cancer is a group of diseases that cause cells in the body to change and grow out of control. Most types of cancer cells eventually form a lump or mass called a tumor, and are named after the part of the body where the tumor originates. Breast cancer begins in the breast tissue that is made up of glands for milk production, called lobules, and the ducts that connect the lobules to the nipple. The remainder of the breast is made up of fatty, connective, and lymphatic tissues. [37].

Breast cancer typically is detected either during a screening examination, before symptoms have developed, or after symptoms have developed, when a woman feels a lump. Most masses seen on a mammogram and most breast lumps turn out to be benign; that is, they are not cancerous, do not grow uncontrollably or spread, and are not life-threatening. When cancer is suspected based on clinical breast exam or breast imaging, microscopic analysis of breast tissue is necessary for a definitive diagnosis and to determine the extent of spread (in situ or invasive) and characterize the pattern of the disease.[37].

Stages of breast cancer

Stages are the process physician use to assess the size and location of a patient's cancer. This information is required for the determining the optimal form of treatment. Like other cancer, breast cancer also stages from 0 to stage IV. Breast cancer is divided into 0 to stage IV according to the size and nature of spread (Metastasis)

Stage 0: (Carcinoma *in Situ*) *Carcinoma in situ* is very early breast cancer. In this stage cancer has not invaded into the normal breast tissue and is contained in either the breast duct (ductal carcinoma in situ) or the breast lobule (lobular carcinoma in situ). By definition, this type of cancer is not invasive and is not able to travel to the lymph nodes or other parts of the body.

Stage I: In this stage the tumor size is not more than 2 cm in diameter and has not spread to distant parts of the body.

Stage II: In this stage the tumor is larger than the stage I that means 2-5 cm in diameter. Like stage I it indicates that it has not spread to distant parts of the body but it may or may not be spread to axillary lymph nodes.

Stage II (a) Tumor size is >5 cm in diameter but has not spread to axillary lymph nodes

Stage II (b) Tumor size is <2cm in diameter but has spread to less than 4 axillary lymph nodes.

Stage III (Locally advanced cancer): in this stage cancer spread to axillary lymph nodes.

Stage III (a) Tumor size is >5cm and spread to axillary lymph nodes

Stage III (b) tumor size is <2cm in diameter but the cancer has spread to axillary lymph nodes above the collar bones.

Stage IV: Tumor spread distant parts of the body like bones, liver and kidney.

Signs and Symptoms of Breast cancer

Breast cancer typically produces no symptoms when the tumor is small and most easily cured. Therefore, it is very important for women to follow recommended screening guidelines for detecting breast cancer at an early stage. When breast cancer has grown to a size that can be felt, the most common physical sign is a painless lump. Sometimes breast cancer can spread to underarm lymph nodes and cause a lump or swelling, even before the original breast tumor is large enough to be felt. Less common signs and symptoms include breast pain or heaviness; persistent changes to the breast, such as swelling, thickening, or redness of the breast's skin; and nipple abnormalities such as spontaneous discharge (especially if bloody), erosion, inversion, or tenderness.

Beside these some others symptoms are important, like. [38]:

- ❖ Lump or mass in the armpit
- ❖ A change in the size or shape of the breast
- ❖ Abnormal nipple discharge
- ❖ Usually bloody or clear-to-yellow or green fluid
- ❖ May look like pus (purulent)
- ❖ Change in the color or feel of the skin of the breast, nipple, or areola
- ❖ Dimpled, puckered, or scaly
- ❖ Retraction, "orange peel" appearance
- ❖ Redness
- ❖ Accentuated veins on breast surface
- ❖ Change in appearance or sensation of the nipple
- ❖ Pulled in (retraction), enlargement, or itching
- ❖ Breast pain, enlargement, or discomfort on one side only
- ❖ Any breast lump, pain, tenderness, or other change in a man

- ❖ Symptoms of advanced disease are bone pain, weight loss, swelling of one arm, and skin ulceration

It is important to note that pain (or lack thereof) does not indicate the presence or the absence of breast cancer. Any persistent abnormality in the breast should be evaluated by a physician as soon as possible.

Breast Cancer Risk Factors

A risk factor is anything that increases your chance of getting a disease, For example Smoking is a risk factor for cancers of the lung, mouth, larynx, bladder, kidney, and ischemic heart diseases. But having risk factor does not mean that the disease is certain. Risk factors also can be divided into risk determinants and risk modulators. Determinants cannot be changed or influenced on the other hand risk modulators can be changed or influenced. Many of the known breast cancer risk factors such as sex, age, family history, early menarche, and late menopause, are not modifiable, that is they cannot be changed. However, other factors associated with increased breast cancer risk, including postmenopausal obesity, use of combined estrogen and progestin menopausal hormones, cigarette smoking, and alcohol consumption are modifiable. Many risk factors affect lifetime exposure of breast tissue to hormones (early menarche, late menopause, obesity, and hormone use). Reproductive hormones are thought to influence breast cancer risk by increasing cell proliferation, thereby increasing the likelihood of DNA damage, as well as promotion of cancer growth. Many of the known risk factors for breast cancer are specifically associated with the ER+/luminal A subtype; less is known about risk factors for ER- and triple negative (basal-like) breast cancers. The table below indicates the factors that increase relative risk for breast cancer in women. [37].

Factors that increase the relative risk for breast cancer in women	
Relative Risk	Factor
>4.0	• Age (65+ vs. <65 years, although risk increases across all ages until age 80) • Biopsy-confirmed atypical hyperplasia • Certain inherited genetic mutations for breast cancer (<i>BRCA1</i> and/or <i>BRCA2</i>) • Lobular carcinoma in situ • Mammographically dense breasts • Personal history of early onset (<40 years) breast cancer

	• Two or more first-degree relatives with breast cancer diagnosed at an early age
2.1-4.0	• Personal history of breast cancer (40+ years) • High endogenous estrogen or testosterone levels (postmenopausal) • High-dose radiation to chest • One first-degree relative with breast cancer
1.1-2.0	• Alcohol consumption • Ashkenazi (Eastern European) Jewish heritage • Diethylstilbestrol (DES) exposure • Early menarche (<12 years) • Height (tall) • High socioeconomic status • Late age at first full-term pregnancy (>30 years) • Late menopause (>55 years) • Never breastfed a child • No full-term pregnancies • Obesity (postmenopausal)/adult weight gain • Personal history of endometrium, ovary, or colon cancer • Recent and long-term use of menopausal hormone therapy containing estrogen and progestin • Recent oral contraceptive use

Determinant risk factors

Personal and family history

Family history of breast cancer

Women (as well as men) with a family history of breast cancer, especially in a first-degree relative (mother, sister, daughter, father, or brother), are at increased risk of developing breast cancer; this risk is higher if more than one first-degree relative developed breast cancer. Compared to women without a family history, risk of breast cancer is 1.8 times higher for women with one first-degree female relative who has been diagnosed, nearly 3 times higher for women with two relatives, and nearly 4 times higher for women with three or more relatives. [39] Risk is further increased when the affected relative was diagnosed at a young age.

It is important to note that the majority of women with one or more affected first-degree relatives will never develop breast cancer and that most women who develop breast cancer do not have a family history of the disease. A family history of ovarian cancer is also associated with increased breast cancer risk in both men and women. Women with a history of breast or ovarian cancer in their immediate family or in either parent's extended family should discuss this with their physicians because it may signal the presence of a genetic predisposition to cancer. [39].

Genetic predisposition

It is estimated that 5% to 10% of breast cancer cases result from inherited mutations, including those in the breast cancer susceptibility genes *BRCA1* and *BRCA2*. [41]. These mutations are present in less than 1% of the general population, but occur more often in certain ethnic groups such as those of Ashkenazi (Eastern European) Jewish descent. [40] The estimates of the risk of breast cancer in women with these mutations vary; by age 70, between 44% and 78% of women with *BRCA1* mutations and between 31% and 56% of women with *BRCA2* mutations will develop breast cancer. [41,42]

Only about 15%-20% of familial breast cancers are attributed to *BRCA1* or *BRCA2* gene mutations. Other inherited conditions associated with smaller increased breast cancer risk include Li- Fraumeni and Cowden syndromes and a number of more common genetic mutations. [43] These mutations can be inherited from either parent and by sons as well as daughters.

Personal history of breast cancer

Women with a history of breast cancer are at increased risk for developing a second breast cancer. The risk is higher if the diagnosis was at a younger age. Women diagnosed with early onset breast cancer (age<40) have almost a 4.5-fold increased risk of subsequent breast cancer. [44] Genetic predisposition, such as mutations in *BRCA1* and *BRCA2* genes, probably contribute to some of the excess risk of subsequent breast cancers, particularly among women diagnosed at a young age. [45]

Lobular carcinoma in situ

This uncommon condition is the result of abnormal cells forming in the lobules or milk-producing glands of the breast. Although LCIS seldom becomes invasive cancer, women with LCIS are 7 to 12 times more likely to develop invasive cancer in either breast than women without LCIS. [46]. LCIS is not usually apparent on a mammogram and is typically discovered during a biopsy performed for another reason, such as an abnormal mammogram. Pure LCIS should be distinguished from DCIS

and pleomorphic LCIS, as both of these conditions are considered precursor lesions for breast cancer and require cancer-directed therapy.

Benign breast disease

Some types of benign breast conditions are linked to breast cancer risk. Doctors often categorize these conditions into 3 general groups, reflecting the degree of risk: non proliferative lesions, proliferative lesions without atypia (abnormal cells or patterns of cells), and proliferative lesions with atypia. Non proliferative lesions are not associated with overgrowth of breast tissue and have little to no effect on breast cancer risk. Examples of non proliferative lesions include fibrosis (also known as fibrocystic changes), simple cysts, and mild hyperplasia. Proliferative lesions without atypia are associated with a small increase in the risk of breast cancer (1.5 to 2 times the risk of those who do not have one of these lesions) and include non-atypical (or usual) ductal hyperplasia and fibro adenoma. [47]. Proliferative lesions with atypia are associated with the greatest breast cancer risk 4 to 5 times higher than average risk[48]. These include atypical ductal hyperplasia (ADH) and atypical lobular hyperplasia (ALH). Women should keep detailed records of any benign breast biopsy results, as this information is valuable for risk assessment, screening, and counseling for chemoprevention and risk-reduction strategies.

Breast density

High breast tissue density (a mammographic indicator of the amount of breast and connective tissue relative to fatty tissue in the breast) has been shown to be a strong, independent risk factor for the development of breast cancer.[49]. A number of factors can affect breast density, such as age, menopausal status, the use of certain drugs (such as menopausal hormone therapy), pregnancy, and genetics. Breast density is influenced by inherited genetic factors, but decreases with age and is further reduced by pregnancy and menopause.[50]. Percent breast density is generally lower among women with higher body weight because of the higher proportion of fatty tissue. [51]. The risk of breast cancer increases with increasing breast density; women with very high breast density have a 4- to 6-fold increased risk of breast cancer compared to women with the least dense breasts. [51].

Endogenous hormone levels

Postmenopausal women with high levels of endogenous hormones (estrogen or testosterone produced naturally in the body) have about twice the risk of developing breast cancer compared to women with the lowest levels. [50]. High circulating hormone levels are associated with and may reflect the effects of other breast cancer risk factors, such as postmenopausal obesity and alcohol use.[51].

Menstrual cycles

Women who have had more menstrual cycles because they started menstruating early (before age 12) and/or went through menopause later (after age 55) have a slightly higher risk of breast cancer. [52]. the increased risk may be due to longer lifetime exposure to reproductive hormones.

Pregnancy

Younger age at first full-term pregnancy (<30 years) and a greater number of pregnancies decrease the risk of breast cancer over the long term; however, there appears to be a transient increase in breast cancer risk following a full-term pregnancy, particularly among women who are older at first birth.[52] Pregnancy-related risk factors seem to be more strongly related to hormone receptor-positive than hormone receptor-negative breast cancers.[53,54]

Breastfeeding

Most studies suggest that breastfeeding for a year or more slightly reduces a woman's overall risk of breast cancer. [55]. The protective effect may be greater for basal-like breast cancers. [55]. Longer duration is associated with greater risk reduction. In a review of 47 studies in 30 countries, the risk of breast cancer was reduced by 4.3% for every 12 months of breastfeeding. [56]. One possible explanation for this effect may be that breastfeeding inhibits menstruation, thus reducing the lifetime number of menstrual cycles. Another possible explanation relates to structural changes that occur in the breast following lactation and weaning.

Bone mineral density

High bone mineral density in postmenopausal women has been associated with increased risk for breast cancer in many, but not all, studies; risk appears to be most strongly related to ER+ disease. [57]. Bone density is not an independent risk factor for breast cancer, but a marker for cumulative estrogen exposure. [57]. Bone density is routinely measured to identify women at increased risk for osteoporosis (high bone density indicates absence of osteoporosis) and may help determine a woman's risk for developing breast cancer.

Risk modulators-Lifestyle-related factors

Postmenopausal hormone use

Recent use of menopausal hormones (also referred to as hormone therapy or HT) with combined estrogen and progestin increases the risk of developing and dying from breast cancer, with higher risk associated with longer use. [58] Risk is also greater for women who start hormone therapy soon after the onset of menopause compared to those who begin use later. [5] The increased risk appears to diminish within 5 years of discontinuation of hormone use. [58]

Obesity and weight gain

Obesity increases the risk of postmenopausal breast cancer. The risk of postmenopausal breast cancer is about 1.5 times higher in overweight women and about 2 times higher in obese women than in lean women. Breast cancer risk associated with excess weight is likely due to high estrogen levels because fat tissue is the largest source of estrogen in postmenopausal women.[60]

Physical activity

Growing evidence suggests that women who get regular physical activity have a 10%-20% lower risk of breast cancer compared to women who are inactive, with stronger evidence for postmenopausal than premenopausal women.[60] A recent report from the Nurses' Health Study of more than 95,000 women found that increases in physical activity after menopause lowered breast cancer risk by 10%.[61].The benefit may be due to the effects of physical activity on body mass, hormones, and energy balance.[62].

Diet

Although numerous studies have examined the relationship between food consumption (including fat, soy, dairy, meat, and fruits and vegetables) and breast cancer, there is no conclusive evidence that diet influences breast cancer risk. [63] A recent meta-analysis of animal fat intake and breast cancer, which included more than 20,000 breast cancer cases, concluded there was no association. [64]. similarly, reducing dietary fat in postmenopausal women did not affect risk of breast cancer in the Women's Health Initiative dietary intervention. However, the timing of the exposure may be important, as findings from the Nurses' Health Study showed that a high-fat diet during adolescence was associated with a moderate increase in premenopausal breast cancer risk. [65].

Alcohol

Numerous studies have confirmed that alcohol consumption increases the risk of breast cancer in women by about 7% to 12% for each 10g (roughly one drink) of alcohol consumed per day.[66] The

increased risk is dose-dependent and exists regardless of the type of alcoholic beverage consumed.[66] One of the mechanisms by which alcohol increases risk of breast cancer is by increasing estrogen and androgen levels.[67] Alcohol use has been more strongly related with increased risk for ER+ than ER- breast cancers.

Tobacco

In 2009, the International Agency for Research on Cancer concluded that there was limited evidence that tobacco smoking causes breast cancer in women based on a review of 150 studies. [68] A recent meta-analysis by American Cancer Society researchers found that current smokers had a 12% higher risk of breast cancer than women who never smoked.[69] Research also suggests that risk may be greater for women who begin smoking before first childbirth.[70]

Oral contraceptive use

Recent use of oral contraceptives may increase the risk of breast cancer by about 10% to 30%; however, since most studies have looked at older, high-dose estrogen forms of oral contraceptives, the risk with current, low-dose formulations is not clear. [71] Women who have stopped using oral contraceptives for 10 years or more have the same risk as women who never used the pill.[71]

Prevention:

Primary prevention:

The aim of primary prevention is to eliminate or modify established risk factors for developing breast cancer. Some of these risk factors are genetically, environmental and behavioral. It is really impossible or difficult to alter or modify genetically and environmental risk factors like age, positive family history, race or ethnicity. But there are some behavioral risk factors like using HRT and consumption of alcohol that can be altered. It is obvious that knowledge and awareness about the breast cancer can impact directly upon behavior leading to modify breast cancer risk. Strategies that may help reduce the risk of breast cancer include avoiding weight gain and obesity, engaging in regular physical activity, and minimizing alcohol intake.[72] Women who choose to breastfeed for an extended period of time (studies suggest a year or more) may also reduce their breast cancer risk. Women should consider the increased risk of breast cancer associated with the use of estrogen and progestin when evaluating treatment options for menopausal symptoms.

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Secondary prevention:

Secondary prevention comprises the diagnosis and treatment of early cancer. It is proved that detection of breast cancer in an early stage has a potential value [73, 74]. Early detection could mean earlier diagnosis of symptomatic breast cancer, as well as the detection of occult breast cancer through the mammography screening in an asymptomatic woman. In 2002, the Global summit consensus Conferences, recommended a step wise process for building the foundation for achieving earlier detection. Their recommendations underlined the importance to promote the empowerment of women to seek and obtain health care; to create the infrastructure for diagnosis and treatment of breast cancer and to promote early detection through breast cancer education and awareness. Their report also recommended that if recourses become available, early detection effort should be expanded to include mammography screening. However, programs for early detection have little value if the existing health care services cannot provide proper breast cancer treatment. Breast cancer treatment must be available, promptly accessible and affordable. [73].

Breast Cancer Screening

According to American Cancer Society guidelines, early detection measures of breast cancer vary depending on a woman's age and include mammography and clinical breast examination (CBE), as well as magnetic resonance imaging (MRI) for women at high risk.

Breast cancer awareness:

Education and awareness alone may contribute in a favorable shift in the stage of breast cancer at presentation. Education can be achieved with very low costs, simple, and popular means, such as radio and television advertisement and programs. Education need to be culturally appropriate and targeted toward the individual population so that highest benefit can be gained. It is also important to educate men as well as women because men can facilitate early detection in their partner and help to reduce the barrier to seek care.

A study conducted in the United Kingdom found that in the 1980s before the national breast cancer screening program began; the rate of advanced stage cancer was reduced dramatically. [75]. It is believed that this down staging was due to increased awareness that resulted from the greater presence of public education messages about early education. [75]. The important aspect of awareness is the dissemination of

knowledge about that breast cancer is curable and if diagnosed early survival rate is good. With earlier stage at presentation and with good treatment facilities it is not a big problem. [76]

It is also important to educate health care providers, especially those who come in regular contact with women. These providers may be physicians, nurses, midwives, medical students. Evidence suggest, for example that nurses can play an important role providing the information regarding breast cancer in countries with limited resources. [77].

Breast self-awareness

Breast self examination (BSE) is a simple and cost effective method of breast cancer screening in limited resources countries. BSE is a formalized practice that a women is taught to examine her own breast regularly (usually monthly after 20 years.) During the breast self examination (BSE), a women systematically inspect, and palpate her each breast using her controlateral hand with her ipsilateral arm raised above her head. She performs her examination both in lying and standing position. Usually it is better to examine the breast in front of mirror so that she can inspect any sort of asymmetry or dimpling. [76]. The BSE is done in an attempt to find out breast cancer earlier and reduce mortality. Several studies based on breast cancer patient's retrospective self reporting on their BSE have shown a positive relation with early detection of breast cancer and BSE.[78].There are also evidence that most of the early breast cancer is self-discovered. On the other hand, evidence from recent studies has raised the question of efficacy of teaching BSE. Two randomized control trial of BSE that was conducted in St. Petersburg, Russia and Shanghai, China showed no clear evidence to support the role of routine BSE. [79, 80] Neither of these studies showed a reduction in the risk of dying from breast cancer in women who were taught BSE. Based on these result, plus the result of multiple observational studies a working group of IARC concluded that there is inadequate evidence that BSE can reduce mortality from breast cancer. [81]

Clinical breast examination (CBE)

Clinical Breast Examination (CBE) is a standardized procedure whereby a health care provider examines a women's breast, chest wall, and axillae. The examination consist of 1) Visual inspection of the breast while the women in upright position and her arms relaxes and then raised above her head. 2) Palpation of the axillae and supraclavicular fossae when the women in the upright position and 3) palpation of the breasts while the women both in upright and supine positions. The examiner inspects the breast visually for symmetry, skin of the breast, areola, and nipple for oedema, erythema, puckering, dimpling, or ulceration, all of which can be evidence of underlying masses. The provider palpates the regional axillary

nodes. Enlarged hard, matted or fixed nodes can indicate cancer. CBE training is necessary as a key contributor to prompt diagnosis of symptomatic disease. In addition, it is likely to be use in area where mammography examination is unavailable.[76]. The Canadian national breast cancer screening study found no significant difference in breast cancer mortality between the groups offered mammography and the group offered CBE. [78]. For average-risk, asymptomatic women in their 20s and 30s, it is recommended that a breast exam be a part of a regular health examination, preferably at least every 3 years. For women 40 or older, annual CBE can be an important complement to mammography, since a small percentage of cancers may be missed by mammography ideally; women should have their CBE shortly before their annual mammogram.[37].

Mammography

Mammography is a low-dose x-ray procedure that allows visualization of the internal structure of the breast. Dedicated mammography units used today result in higher-quality images with a considerably lower x-ray dose than the general-purpose x-ray equipment used in the past. Conventional (film) mammography has been largely replaced by digital mammography, which appears to be even more accurate for women younger than age 50 and for those with dense breast tissue. [82].

It's recommends that women receive an annual mammogram beginning at age 40. Combined results from randomized screening trials suggest that mammography reduces the risk of dying from breast cancer by 15% to 20%, whereas studies of modern mammography screening programs in Europe found that the risk of breast cancer death was reduced by more than one-third. [83]. One of the big criticisms of mammography is false positive test results which sometimes lead to follow-up examinations, including biopsies, when there is no cancer.[84]

Breast Cancer Treatment

Treatment decisions are made by the patient and the physician after consideration of the optimal treatment available for the stage and biological characteristics of the cancer, the patient's age and preferences, and the risks and benefits associated with each treatment protocol. Most women with breast cancer will have some type of surgery. Surgery is often combined with other treatments such as radiation therapy, chemotherapy, hormone therapy, and/or targeted therapy.

Overview of breast cancer situation worldwide

Breast cancer incidence rates vary from 19.3 per 100 000 women in Eastern Africa to 89.9 per 100 000 women in Western Europe, and are high (more than 80 per 100 000) in developed regions of the world (except Japan) and low (less than 40 per 100 000) in most of the developing regions. Although developed countries have the highest incidence rates, in the transition countries as in Latin America the estimated rates are supposed to increase in the future.[85] The rates vary worldwide being the highest in Europe, and they are increasing in Asian and Latin-American countries mainly due to the population ageing and screening practices.[86-89].

Breast cancer rates cover from 1 to 5% of Asia, Africa and South America. Therefore data on incidence is limited in these continents due to several factors as lack of resources, priority and lack of trained staff. In African specifically, due to the limited incidence data found in Population-Based Cancer Registries in this continent, the information is mostly based on studies and reviews from the active population cancer registries in this area. The highest incidence rates of breast cancer in Africa are estimated for South African Republic and the lowest rates for Sudan and Ghana. [85] Recent data from North Africa covering 13% of the population in the region describes low rates for breast cancer: between 30-40/100 000, except in Algeria where the rates are similar to those of Europe, namely 60.5/100 000.[90].

In the rural area of Eastern Cape Province of South Africa the rate of breast cancer is 7.5/100 000. [91]. In African women there is an overrepresentation of triple-negative breast cancer, which is the most aggressive cancer with the worst prognosis. [92]. There has been an increase of breast cancer in Uganda (+4.5% since 1991) but the increase was more evident in fifty-year old women than in young women.[93]. Although incidence rates for breast cancer are low in Africa, in some of African countries it remains the most common cancer with higher rates in premenopausal women. [94].

Breast cancer situation in Rwanda

Breast cancer is a significant public health problem in Rwanda and remains the most common cancer diagnosed for women at health facilities in Rwanda. Though there is no official registry for cancer in Rwanda, Statistics from health facility show that breast cancer is predominant cancer among women in Rwanda. Statistics from Butaro Cancer Center of Excellence indicate that Breast cancer account for 28.7% of all reported cancer followed by cervical cancer 21.3%. [95].

Table 1: Butaro Cancer Center for Excellence cancer diagnoses (July 2012–June 2013)

Cancer type	Number of cases	Percentage
<i>Adult (N = 661)</i>		
Breast cancer	190	28.7
Cervical cancer	141	21.3
Non-Kaposi's skin cancer	46	7.0
Head and neck cancer	38	5.7
Colorectal cancer	26	3.9
Gynaecological malignancies other than cervical	26	3.9
Chronic myeloid leukaemia	22	3.3
Gastric cancer	21	3.2
Other cancer types	151	22.8
<i>Paediatric (N = 102)</i>		
Nephroblastoma	28	27.5
Acute lymphoblastic leukaemia	25	24.5
Hodgkin's lymphoma	10	9.8
Rhabdomyosarcoma	7	6.9
Burkitt's lymphoma	5	4.9
Osteosarcoma	5	4.9
Other cancer types	22	21.5

Source: Bringing cancer care to the poor: experiences from Rwanda, Lawrence N. hulman, Tharcisse Mpunga, Neo Tapela, Claire M. Wagner, Temidayo Fadelu& Agnes Binagwaho Nature Reviews Cancer14,815–821(2014)

A study conducted in Rwanda and Sierra Leone showed an increasing of breast cancer incidence in low- and middle-income countries (LMIC). This study aimed to estimate the prevalence of breast masses in Rwanda (RW) and Sierra Leone (SL) and identifies barriers to care for women with breast masses. Out of 3,469 households (1,626 Rwanda; 1,843 Sierra Leone) surveyed and 6,820 persons (3,175 Rwanda; 3,645 Sierra Leone) interviewed. Breast mass prevalence was reported 3.3% (SL) and 4.6% (RW). Overall, 93.8% of masses were in women, with 49.1% (SL) and 86.1% (RW) in

women >30 years. 73.7% (SL) and 92.4% (RW) of women reported no disability; this was their primary reason for not seeking medical attention. Overall, 36.8% of women who reported masses consulted traditional healers only. [96].

Late presentation with advance stage is the common feature of breast cancer patient in Rwanda, when it is extremely difficult to manage the deadly disease. It is easily understandable that the incidence and mortality of breast cancer is growing at a fast rate. But as we do not have any cancer registry along with relevant data it is difficult to say the exact situation in Rwanda. The first and only study conducted on characteristics and presentation of patients with breast cancer in Rwanda indicated that. The average age for patients with breast cancer was 48.5 years. Eighty-five percent presented with more than 12 weeks delay after an abnormality was noted. The study shows that Forty-eight percent underwent mastectomy, 20% lumpectomy, and 3% mastectomy and chemotherapy while data on stage were limited and histopathologic data were unavailable. The study results realized the needs for registries to capture stage, pathologic features, and survival, as well as the need for research on causes of delayed presentation in Rwanda. [97].

A study conducted on caring for patients with surgically resectable cancer in a specialized centre in rural Rwanda indicated that of 278 patients, 76.6% were female, 51.4% were aged 50 –74 years and 75% were referred from other district or tertiary hospitals in Rwanda. For the 250 patients with treatment details, 115 (46%) underwent surgery, with or without chemotherapy/radiotherapy. Median time from admission to surgery was 21 days (IQR 2–91).

Breast cancer was reported to be the most common type of cancer treated at BCCOE, while other forms of cancer (cervical, colorectal and head and neck) were mainly operated on in tertiary facilities. Ninety-nine patients had no treatment; 52% of these were referred out within 6 months, primarily for palliative care. At 6 months, 6.8% had died or were lost to follow-up. The study highlighted the challenges such as inadequate surgical infrastructure and skills, and patients presenting late with advanced and unresectable disease can limit the ability to manage all cases. [98].

In Rwanda, still communicable diseases, infectious diseases and chronic diseases is a major health issue. Government and stakeholders are giving their utmost effort to cope with these diseases. Cancer and particularly breast cancer is on the bottom of their priority list. That's why there is no much infrastructure and facilities to fight against breast cancer. Currently there are no oncology departments in hospitals and only one Butaro Cancer Center of Excellence exists. The Butaro Cancer Center of Excellence is located within Butaro Hospital in northern rural Rwanda, and provides a full

spectrum of cancer care including screening, diagnosis, chemotherapy, surgery, patient follow-up, and palliative care. It serves as the first facility to implement standardized cancer training and protocols that align with Rwanda's new national guidelines.

Recently, Rwanda Ministry of Health through Rwanda Biomedical center has intensified its campaign to promote breast cancer awareness and screening among women to decrease the prevalence of breast cancer in the country. They are primarily focusing on the younger generation to fight against breast cancer and have recommended regular practice of BSE for early detection, reporting and treatment of this type of cancer.

According to Rwanda Biomedical Center/Division of non communicable diseases in order to raise awareness among both community and health care providers, and learn about breast cancer care and treatment, RBC/NCDs Division and Cancer TWG is organizing different activities including radio spots airing, Town hall meeting, press conference and a one day Symposium on breast cancer management and Palliative Care in Rwanda. [99].

Early diagnosis is important for effective treatment and long term survival in breast cancer. Research suggests that women medical health seeking behavior depends on factors related to their knowledge, believes and breast cancer management. [100]. Preventive behavior is an essential element for reducing cancer mortality. Knowledge is a necessary predisposing factor for behavioral change. [101].

However, in Rwanda where literate rate is not that high, poverty, culture and religion play an important role for health seeking behavior. Especially for women in rural areas one can easily assume that knowledge will be poor and practice and attitude will be even poorer. Therefore, to educate women about the warning sign symptoms and strive for improvement of health seeking behavior by making them aware is an important step to drag down high incidence and mortality rate from breast cancer. In this regard, different professions like health worker professionals, media, academic teachers and leaders can play a vital role to educate people.

1.2 Problem formulation

Each year, breast cancer is newly diagnosed in more than 1 million women worldwide and more than 400,000 women die from it [102,103]. Breast cancer as a public health problem is growing throughout the world, but especially in developing regions, where the incidence has increased as

much as 5% per year. [102,104].The mortality: incidence ratio is much higher in developing countries than in developed countries: only half of global breast cancers are diagnosed in the developing world, but they account for three-fourths of total deaths from the disease. [102].The increasing burden of breast cancer is also acknowledged in the resolution on cancer prevention and control, as adopted by the 58th World Health Assembly in May 2005. [105]. Therein, member states are urged to develop and reinforce comprehensive cancer control programs to reduce cancer mortality and improve quality of life for patients and their families.

In North America, Western Europe and Australia, breast cancer mortality rates have declined, mainly due to improvements in early detection and treatment, and high breast cancer awareness levels in the population, surveys and national screening programs. Five year breast cancer survival rates are higher than 70% in most developed countries and less than 40% for most developing countries; mainly due to low awareness levels, lack of access to early diagnosis and treatment options. [106].

In Nigeria breast cancer trends were declining and frequency of hospital attendance has risen, reduced late presentation and this was attributed to several factors; increased awareness about breast cancer , improved early detection methods and usefulness of breast self examination [107,108,109]. The most pragmatic solution to early detection and prevention lies in breast cancer education of women to be able to judge their risk and take relevant measures.

The community health workers are an important component of health services that bridges between the need of services delivery, social and economic development, and the Millennium Development Goals (MDGs). Community health workers remain at the forefront of Rwandan health system. No study has been conducted to assess their level of breast cancer risk factors and early detection awareness and in view of the expanded community health workers are expected to play in national campaigns on breast cancer prevention and treatment, breast care, and embarking on improved breast cancer services and national prevention programs, and the helping role of CHWs in promoting healthy behaviors in communities. It's thus important to assess female community health workers' awareness of breast cancer risk factors, and early detection. Little is known about general breast cancer awareness, prevention, and early detection practices among women in Rwanda general and among community health workers specifically. This study investigated baseline knowledge that can be essential to the development of culturally and linguistically appropriate educational programs that

promote understanding of and attention to evidence-based, lifestyle-directed breast cancer prevention interventions, breast health awareness, and early detection and treatment.

The aim of this study is to assess breast cancer risk factor awareness, early detection measures and associated factors among female community health workers. The study findings can ultimately inform development of effective breast cancer educational resources for Rwandan women aimed at removing barriers to evidence-based prevention and early detection interventions.

1.3. Research questions

- i. What is the awareness level for breast cancer risk factors among female community health workers?
- ii. What factors are associated with the breast cancer risk factors awareness?
- iii. What is the awareness level for breast cancer early detection measures among female community health workers?
- iv. What factors are associated with the awareness of breast cancer early detection measures?

1.4. Study objectives

Overall objectives

The aim of this study was to determine awareness of breast cancer risk factors and early detection measures among female community health workers in Rwanda

Specific objectives

- i. To assess the awareness level for breast cancer risk factors among female community health workers
- ii. To assess the awareness level of early detection measures among community health workers in Rwanda;
- iii. To determine what factors are associated with breast cancer risk factors awareness among female community health workers
- iv. To explore factors associated with breast cancer early detection measures awareness and practice among female community health workers

1.5. Study justification

Rwanda non communicable diseases strategy highlights the government commitment to achieve the goals of economic development and poverty reduction strategy (EDPRS II), the Sustainable Development Goals (SDGs) and Vision 2020.

With the purpose to create healthy promoting environments and to promote community actions to reduce exposure to modifiable NCD risk factors and injuries, the first target to community mobilization and sensitization on NCDs and their risk factors through Information Education Communication (IEC) programmes based at community, District, and Central level. The sensitization has to target all population at different levels through different channels of communication. [110].

The national Non communicable diseases policy has not stated clearly national guidelines for breast cancer awareness, screening, and community intervention, including the role that can be played by health workers in community awareness and early detection. There is an urgent need for awareness of breast cancer and its early detection measures. Similarly, baseline reports on current level of knowledge would be vital to an effective awareness program, hence the need for these studies assessing level of awareness of breast cancer risk factors and early detection measures in the health workers and general population.

While NCDs impose severe costs on national health-care systems and economies as a whole, NCDs prevention is still not featured as a priority in most national public health agendas. It is therefore essential to move from programs to treat NCDs to risk factor prevention and initiatives for health promotion at every level (individual, family, community and national). The CHWs can play a great role in promoting preventive healthcare strategy in the community. The outcomes of interventions make it evident that they can counsel patients towards health seeking behavior and provide them motivation necessary for treatment compliance. It is therefore imperative to the achievement of MDGs that the CHW can be deployed to the regions farther from the reach of physicians. [111].

Given the fact that not all patients utilize health facilities for routine check-ups and that NCDs like breast cancer symptoms are not recognized until the late stages when complications are apparent, employing CHWs to increase awareness about prevention and control of diseases in communities is crucial. CHWs could strengthen the link between health services and the community, increasing access to services, especially in underserved communities. [112].

This study included female CHWs, because they are in continuous contact with women and mothers who are in risk group of getting breast cancer, and hence would be an important source of information for the mothers and entire community. Female Community health workers are expected to act as role models and educate the public and the rest the community in their villages. It's thus important to assess their knowledge of risk factors for breast cancer and practice of breast cancer screening so as to understand their level of knowledge, attitudes and screening practices towards breast cancer.

1.6. Study area/Settings

This study was conducted from June to November in Kigali City. The City of Kigali is divided into three (3) Districts comprising Sectors (35), Cells (161), and Cells are sub divided into Imidugudu literally villages (1061). It is presently inhabited by approximately 1 million inhabitants. Kigali is 70% urban with a significant part that is rural. The population is relatively young with the youth making up about 60%, with women making slightly more the 50%. Since each village is represented with at least two female community health workers. Kigali City is expected to have a total of 3183 community health workers of which 2122 are at least women.

CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

A literature review was conducted by using the PubMed, BioMed and Medline online databases with the keywords: Breast cancer knowledge, attitude and Breast cancer screening. A hand search was also undertaken to relevant journals identified by the electronic search and additional articles identified from the reference list of the key articles. A number of articles have been found on breast cancer knowledge, attitudes and practices, but no article was found regarding Rwanda perspective on breast cancer knowledge attitude and practices.

2.2. Awareness of breast cancer risk factors and screening practices

Findings from a survey conducted on 1830 general female population of UK to elicit knowledge and beliefs about breast cancer revealed that women had limited knowledge on risk factors and breast cancer related symptoms. Only 23% correctly indicated that 1 in 10 have a chance to developed breast cancer. Less than one third recognized the role of advancing age as a potential risk factor. More than 70% of the sample identified that painless breast lump, lump under armpit, nipple discharge are potential symptoms. [113]

Across sectional survey of breast cancer risk factors knowledge among nurses in teaching hospitals in Karachi, Pakistan showed that 35% of nurses had good knowledge of risk factors while 40% had fair knowledge and 25% had had poor knowledge [114].

Findings on breast cancer knowledge, attitudes and practice among nurses in Lagos Nigeria indicated that the knowledge about symptoms, methods of diagnosis and BSE was generally very good. Nevertheless, only 30% had had a CBE and 8% a mammogram within the past three years. 28% did not know how to estimate the risk of cancer and 61% believed they were not at risk [115].

A cross-sectional descriptive study was carried out among female health workers in the two major government health institutions in Benin City, Edo State capital in Nigeria. The study showed high proportion 55% of respondents had very poor knowledge about risk factors for breast cancer. The awareness of mammography as a diagnostic method was very high (80.7%), however an extremely

low knowledge of mammography as a screening method was found. Mammography practice of only 3.1% was found among those above 40 years of age who qualify for routine annual screening. Relatively low knowledge (45.5%) about Breast Self Examination (BSE) as a screening method was found.[116]

Another study of cancer awareness in Nigeria population revealed that only 32% knew that a breast lump was a warning sign of cancer, 58.5% were not aware of most warning signs, while 9.8% knew of methods of detecting cancer and 50% did not know that cancer was curable when detected early. [117].

Another study was done on rural women of Ibadan, Nigeria and found that 73, 7% of the respondents claimed that they did not know any warning signs of breast cancer. Only 1.9% identified that painless lump could be a warning sign. The findings further indicate that the majority (90.7%) of the respondents did not know anything about treatment of breast cancer. More than half of the participants (55.2%) however agreed that early detection and effective treatment can prevent death. Moreover, only 6.4% identified that BSE while 1.2% identified Clinical breast examination and no one could identify that mammography is an early detection measure. [118].

2.3. Factors associated with breast cancer awareness and screening practices

A study done in Lagos, Nigeria to assess breast cancer knowledge, attitudes and practice among nurses showed that the use of breast cancer screening methods was significantly associated with knowledge of the subject ($p=0.03$) and previous care of breast cancer patients.[115].

A study in the UK on women's knowledge about breast cancer risk and their views of the purpose and implications of breast screening showed that there was an association between inaccurate knowledge and lower formal education ($p=0.05$).[119].

A study conducted in Amman, Jordan to assess breast cancer risk factors and screening awareness among women nurses and teachers found that profession, age and family history significantly influenced breast cancer screening awareness. The adjusted mean general awareness score for nurses was significantly different from that of Teacher ($P= 0.8470$) Nurses were more aware than teacher about the

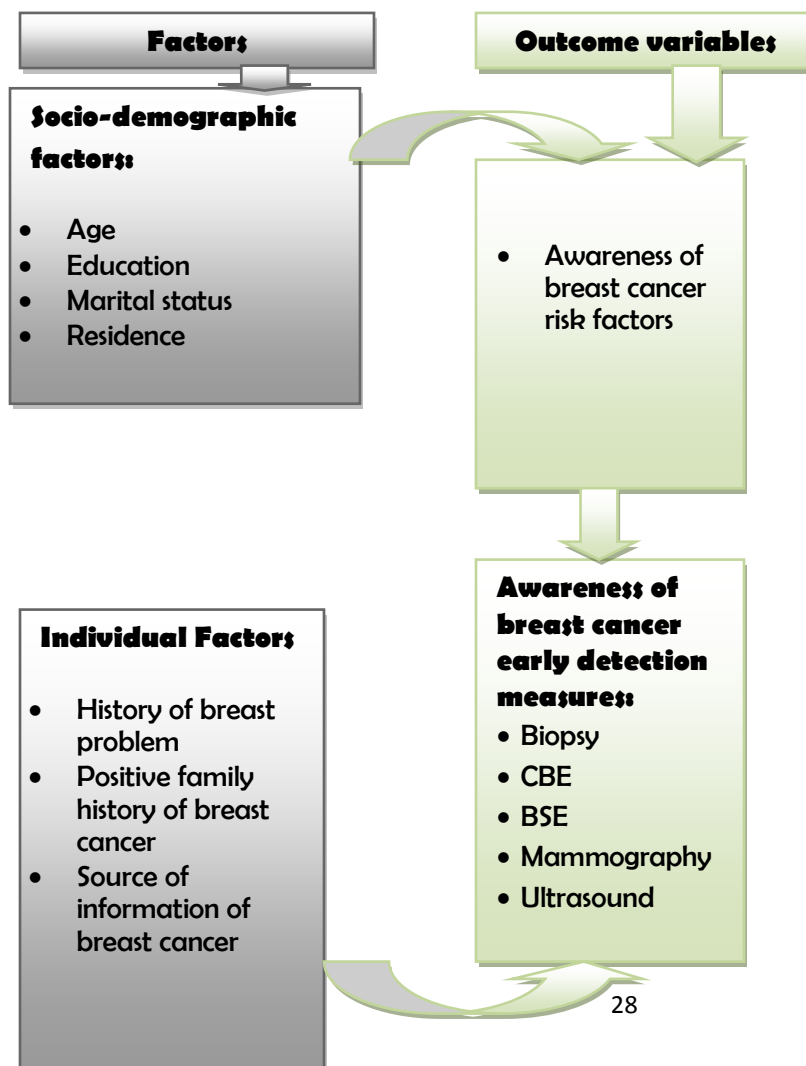
important of breast cancer screening .The adjusted mean screening awareness score for nurses was 88.3% compare with 73.1% for teacher.($P<0.0001$).[120].

A study of BSE: knowledge, attitudes, and practices among female health care workers in Tehran, Iran, revealed that the practice of BSE was significantly associated with age ($p=0.01$), the level of education ($p<0.0001$), and knowledge of how to examine the breasts ($p<0.0001$). [121].

2.4 Conceptual framework of breast cancer risk factors and screening practices (Developed by Investigator)

The conceptual framework below shows the various factors that were conceptualized to independently affect breast cancer risk factors and early detection awareness among the community healthy workers in Kigali; these factors are categorized into socio-demographic, individual and socio-economic status.

Figure 1: Conceptual framework



CHAPTER THREE: METHODS AND MATERIALS

3.1 Introduction

This chapter highlights the methods that were used carry out this study. It outlines the study design, study setting, sampling procedures, sample size estimation, measurements, data collection, data management and analysis as well as quality control measures and ethical considerations.

3.2. Study design

This was a cross-sectional study, which used a quantitative method of data collection and was conducted in June through November, 2016.

3.3. Methods

This study is an exploratory and cross sectional study among a random sample of community health workers in Kigali City. Study population involved female community health workers working and residing in Kigali. Data was collected in June through November 2016. Data collection tools comprised of a structured questionnaire to collect data on variables of interest (awareness of breast cancer risk factors, screening practices and socio demographic characteristics). To ensure the quality of the data collected, research assistants were recruited and trained on the basics of data collection and guidelines for the flow of interview while the questionnaire was pre-tested prior to real data collection to make sure it's fully understandable and exhaustive. Data collected was entered in appropriate statistical software package and analyzed in SPSS 21. Descriptive statistics were performed for each variable of interest. Pearson Chi square test of independence was conducted to assess association between different variables and Fisher's exact test was used to assess the association in case of cross tabulation cells counting less than five observations. We used logistic regression model to assess the relationships between the independent variable(s) (socio-demographic) and the outcome variable(s).

3.4. Study population

This study utilized cross-sectional study design employing quantitative method. The source population of this study was all female community health workers operating and residing in Kigali City. Study population was randomly selected among community health workers on which the actual study was conducted.

3.5. Sample size Determination and Sampling Procedure

Sample Size Estimation

Sample size is determined using sample size formula for estimating a single population proportion with the assumption that margin of error, confidence interval, to be 5% and 95%, respectively. Additionally, the proportion of knowledge of community health workers about breast cancer was considered to be 50% as no current statistic in Rwanda that indicates the level of knowledge of target population about breast cancer. The sample size used the formula by Kish Leslie (1965) for descriptive studies. [122].

$$n = \frac{(z)^2 p(1-p)}{d^2}.$$

Where; **n** = estimated sample size

z = the z-score (1.96) on normal standard variable curve corresponding to 95% confidence level/limit

p = estimated proportion/prevalence of breast cancer risk factors and early detection awareness (50% or 0.5), **d** = allowable margin error (in this case 5%).

$$q = 1 - p = 1 - 0.5 = 0.5$$

Hence; **n** = $(1.96)^2 \times 0.5 \times 0.5 / (0.05)^2$, therefore, **n** = 384.16.

We added 5% of 385 for potential non responses making the final sample size of $385 + 20 = 405$ female community health workers. Hence, a total of 405 CHWs were interviewed.

3.6. Sampling Procedure

The study used simple random with probability proportional to size sampling technique. After calculating the sample size, all districts were considered in the sampling process to select the study subjects. First, the City was stratified into Districts and the sample was distributed to each districts

using probability proportional to their size. Then, from each district a required number of community health workers were selected for each Sectors using probability proportional to the size and the respondents were recruited randomly from each sector using random sampling. Then, sampling frames were prepared from each sector from their rosters in collaboration with the community health worker supervisor at district level. Finally, the study subjects were selected using simple random sampling technique from their respective villages.

Table 2: Number of female community health workers sampled per District

Districts	Villages	Expected # CHWs considering at least 2 female CHWs per village	Proportions of FCHWs per District	Number of FCHWs Per District when applying proportions to sample size of (N=405)
Gasabo	494	988	42.01	168.9
Kicukiro	327	654	27.81	112.6
Nyarugenge	355	710	30.19	122.3
Total	1176	2352	100.00	403.7

Eligibility Criteria

This cross sectional study was conducted over a period of five months from June to November 2016 in the City of Kigali, Rwanda. The participants had to fulfill the following criteria.

Inclusion criteria	Exclusion criteria
• Aged 18 and above • Be a Rwandan female community health worker • Consent to participate voluntary • Available during study timeline	• Do not meet inclusion criteria

3.7. Materials

Measurements

Scoring scheme

Questions assessing breast cancer risk factors (10 items) and screening practices (3 items) were used to evaluate the level of knowledge. The number of correct responses was summed up to create risk factors and screening practices scores. Knowledge of risk factors was assessed by requesting the respondents to determine which of the following were risk factors for breast cancer; *increasing age, obesity, use of contraceptives, positive family history, not breastfeeding, smoking, alcohol consumption, radiation exposure, first child at late age and early onset of menarche*. Thereafter, each correct response was scored one (1) point and each wrong response was scored zero (0). The total score ranged from 1-10. Respondents with scores below the average (5) were considered to have poor knowledge; those with 5-10 points had good knowledge. Three screening practices, Breast self Examination, clinical breast examination and mammography were counted and respondents with knowledge of at least two screening practices was graded good knowledge.

Dependent variable:

A questionnaire of awareness of breast cancer risk factors and early detection had three main sections comprising social-demographic characteristics, exposure to breast cancer information and knowledge of breast cancer risk factors and screening practices. The main dependent variables or outcome variables were breast cancer risk factors and screening practices awareness.

Independent variables:

Social-demographic: age, sex, marital status, educational level, occupation and place of residence (rural or urban)

Individual factors: previous experience with breast cancer, family history of breast cancer, source of information

3.8. Data Collection, Management and Analysis

Data Collection

This study employed quantitative paradigm and hence data were collected using questionnaire through face to face interview. The research team comprised of the principal investigator and three

trained research assistants. The principal investigator together with data collectors administered the survey questionnaire.

Data Management

Data from the questionnaire interviews was entered in appropriate data entry software application CPro (Census and Survey Processing Software) version 5 and later exported to SPSS for windows version 21 for cleaning and analysis. The outcome variables of the study (breast cancer risk factors and screening practices awareness) were transformed into binary or dichotomous categorical variables (poor knowledge and good knowledge). Ten common risk factors and three screening practices were computed into a composite variable each and the median value was used to categorize those with poor knowledge and good knowledge about breast cancer. The sum value less than the median was categorized as poor knowledge and the value greater than or equal to the median was categorized good knowledge.

Statistical tests including Pearson's χ^2 test, binary logistic regression analyses, were used to identify factors related to knowledge of breast cancer risk factors and screening practices. Bivariate analysis was used primarily to check which variables have association with the outcome variables individually. Variables found to have association with the dependent variables were then entered into logistic regression model. Demographic variables for which $P < 0.05$ in bivariate analyses were entered into the multivariate model for controlling the possible effect of confounders and finally retained in model if $P < 0.05$. Odds ratios (OR) with 95% confidence intervals and P value $< .05$ were computed to identify association of predictors to outcome variables.

3.9 Data Analysis

Univariate analysis

Univariate analysis was used to describe the background characteristic profile of the respondents' quantitative variables like age was summarized using descriptive statistics such as means, median, standard deviation and range. Categorical variables were summarized into frequencies, percentages and bar graphs. The breast cancer risk factors and early detection awareness were grouped into two categories (poor, and good) and summarized into percentages.

Bivariate analysis

In order to determine the factors associated with awareness of breast cancer risk factors and early detection methods, bivariate analysis was performed to assess for the association between dependent and independent variables. Chi square test was used as test of independence to determine association between dependent variable/outcome and the independent variables. A p-value of 0.05 or less and a 95% confidence interval limits was used to test for statistical significance. Fisher's exact test was used whenever cross tabulation cells counted less than five observations.

Multivariate analysis

For multivariate analysis, we used a binary logistic regression, a modeling technique which allowed us to examine the relationship between the independent variable(s) (socio-demographic and behavioral variables) and the dichotomous outcome variable(s) breast cancer risk factors awareness and screening practices. Significant factors and demographic characteristics associated with the outcome of interest were identified among participants. Results are reported as odds ratios (ORs) and stated in terms of likelihood. For example, "Those with higher education level are more likely to report awareness of breast cancer. Data analysis was conducted using SPSS 21. Significance for all test was set at $p < .05$.

3.10. Ethical considerations

The study was conducted after getting ethical clearance from Institutional Review Board committee (IRB) of the University of Rwanda School of Medicine and Health Sciences. Permission was obtained from sampled Health Centers in Gasabo, Kicukiro and Nyarugenge Districts. Written informed consent was obtained from the respondents, clearly stating potential risks and benefits of the study and sought their voluntary participation. Confidentiality and privacy were ensured during data collection and reporting.

CHAPTER FOUR: STUDY FINDINGS

4.1. Study participants

A total of 405 female community health workers participated in the study. (122) were recruited from Kicukiro, (170) from Gasabo and (113) from Nyarugenge. The socio demographic characteristics of participants are summarized in Table 3. The participants mean age was 41.8 with a range of 21 to 64 years old. More than two-thirds 61.2% of the respondents were married, 31.6% being single and the remainder either widowed/separated or divorced 7.3%. The majority of respondents (64.1%) had only a primary level of education, 12.5% have completed some three years post primary education, 6.9% completed post primary vocational training while 13.7% had a secondary education and only 2.8% reported having attended university. Most (50.6%) were living of farming activities, 29.7% live by small trade and 11.6% rely on arts and crafts. Seven respondents (2.70%) were salary employee while the remainder was casual laborers (6.2%).

Table 3: Socio-demographic characteristics of participants (n=405)

Age group (Years) (n=399)	Frequency	Percent (%)
21-29	41	10.3
30-39	132	33.1
40-49	130	32.6
50 and over	96	24.1
Marital Status (n=386)		
Married	228	59.1
Married(polygamy)	8	2.1
Single	122	31.6
Widowed/Divorced	28	7.3
Education Attainment(n=393)		
Primary Education	252	64.1
Post primary high education (3years)	49	12.5
Post primary vocational training	27	6.9
Secondary	54	13.7
Tertiary	11	2.8
Occupation(n=354)		
Farming	179	50.6
Trading/Entrepreneur	105	29.7
Arts&crafts	41	11.6
Wage employee	7	2.0
Other (House wife, casual work)	22	6.2

4.2. Knowledge on breast cancer and source of information

Fifty two (13.4%) of the female community health workers interviewed had never heard of breast cancer while 337 (86.6%) had heard of breast cancer, source information being mainly health facility (26.6%) like health center or hospital, followed by media (24.1%) and community meeting 19.5%. Participants who reported receiving information from health care provider and friends were 12.1% and 16.4% respectively.

Table 4: Source of awareness about breast cancer

Sources	Frequency (n=365)	Percent (%)
Hospital/Health center	97	26.6
health workers/provider	44	12.1
Work place	5	1.4
Friend	6	16.4
Media	88	24.1
Community meeting/conversation	71	19.5

Figure 2: Source of information about breast cancer among community health workers in Kigali, November 2016, multiple answers are possible and percents may exceed 100%.

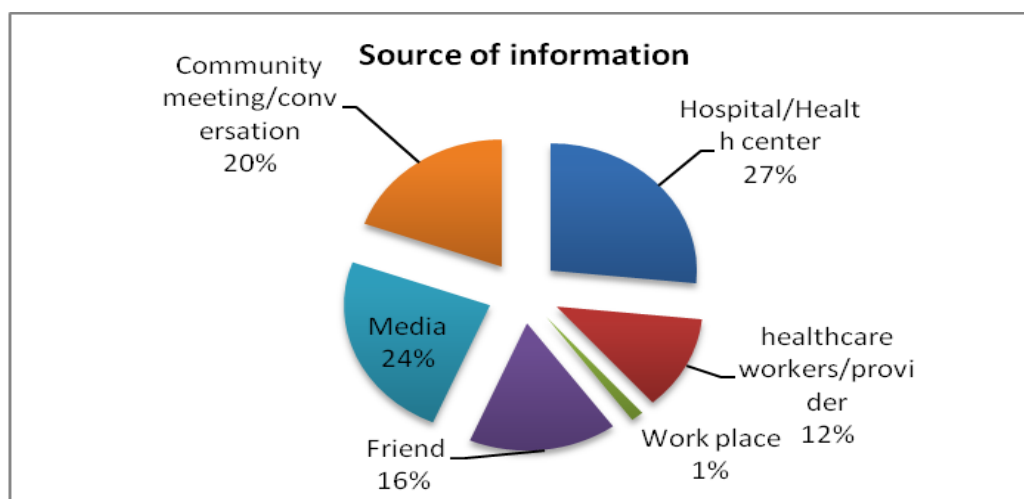
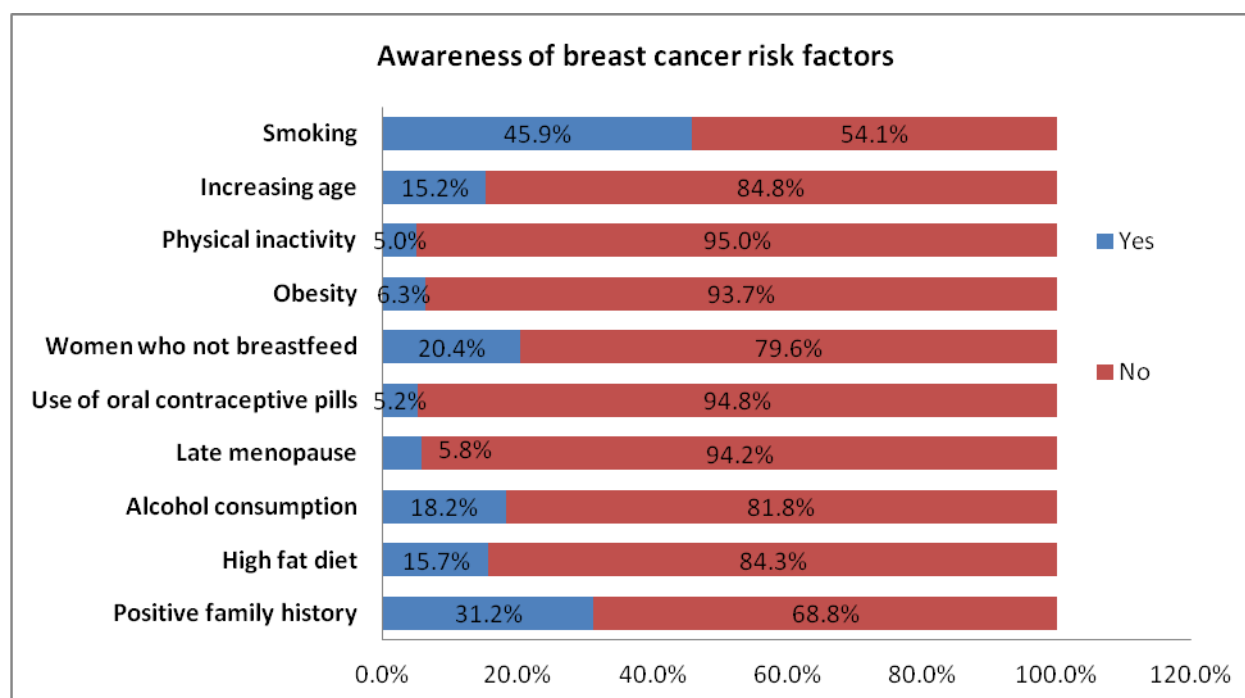


Figure 3: Distribution of study participants by their frequency of knowing breast cancer risk factors, Kigali city, 2016. Percents may exceed 100% as multiple answers are possible.



The figure above displays the knowledge level of respondents about individual breast cancer risk factors. Smoking was the most common risk factor identified by 166 (45.9%) of the respondents followed by positive family history of breast cancer 113 (31.2%) and alcohol consumption 66 (18.2%) and not breastfeeding 74 (20.4%), and increasing age 55(15.2%). The remaining risk factors were reported with less than 10% of respondents.

Table 5: Knowledge and belief of breast cancer risk factors

Knowledge of breast cancer risk factor (n=362)	Yes n(%)	No n(%)
Positive family history	113 (31.2)	249 (68.8)
High fat diet	57 (15.7)	305 (84.3)
Alcohol consumption	66 (18.2)	297 (81.8)
Late menopause	21 (5.8)	342 (94.2)
Use of oral contraceptive pills	19 (5.2)	344 (94.8)
Women who not breastfeed	74 (20.4)	289 (79.6)
Obesity	23 (6.3)	340 (93.7)
Physical inactivity	18 (5.0)	345 (95.0)
Increasing age	55 (15.2)	307 (84.8)
Smoking	166 (45.9)	196 (54.1)

4.3. Knowledge of early warning signs of breast cancer

Regarding the knowledge about the signs and symptoms of breast cancer, 341 (87.7%) and 105 (27.0%) of female community health workers knew that breast cancer presents as painless lump in the breast and pain or soreness in the breast respectively. Ulceration of the breast was also cited by 99 (25.0%) followed by discharge from the breast 93 (23.9%) and discoloration /dimpling of the breast 88 (22.8%). Lump under armpit 76 (19.9%), change in the size of the breast 69 (17.7%), scaling/dry skin in nipple region 49(12.7%) and swelling or enlargement of the breast 47(12.2%) were least known.

Table 6: Awareness of breast cancer signs and symptoms

Awareness of breast cancer symptoms	Yes n(%)	No n(%)
Lump in the breast	341 (87.7)	48 (12.3)
Discharge from the breast	93 (23.9)	296 (76.1)
Pain or soreness in the breast	105 (27.0)	284 (73.0)
Change in the size of the breast	69 (17.7)	320 (82.3)
Discoloration /dimpling of the breast	88 (22.8)	298 (77.2)
Ulceration of the breast	99 (25.4)	290 (74.6)
Swelling or enlargement of the breast	47(12.2)	339 (87.8)
Lump under armpit	76 (19.9)	305 (80.1)
Scaling/dry skin in nipple region	49 (12.7)	337 (87.3)

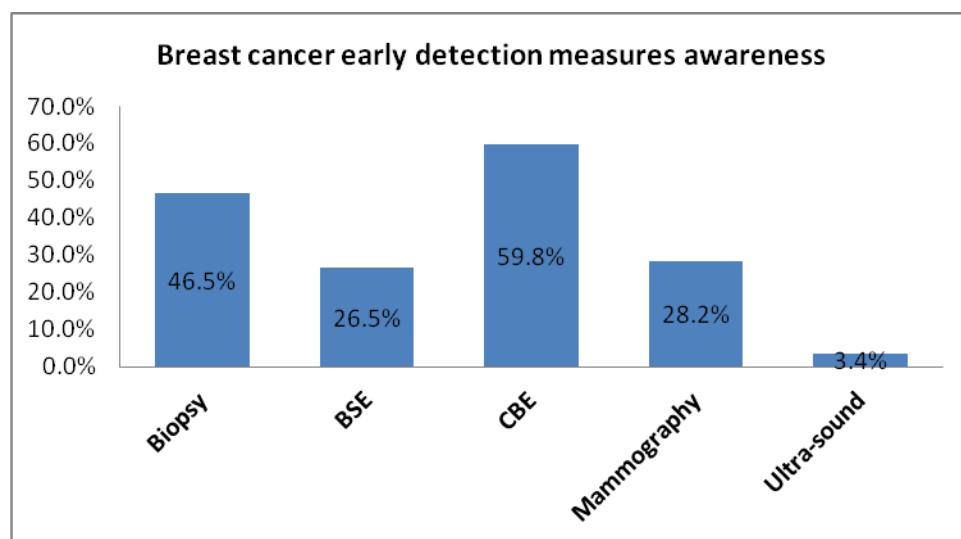
4.4. Knowledge of early detection measures of breast cancer

Regarding the knowledge of means of diagnosing breast cancer, CBE was the most common means of detecting breast cancer, reported by 210 (59.8%) of the participants, followed by pathological examination of breast tissue by using FNAC(Fine Needle Aspiration Cytology) or biopsy 159 (46.5%). Ninety three (26.5%) of respondents mentioned Self Breast Examination (SBE), and only 99 (28.2%) knew Mammography while Ultra sound was reported by 12 (3.4%).

Table 7: Breast cancer early detection measures awareness

Breast cancer detection measures (n=251)	Yes n(%)	No n(%)
Pathological examination of breast tissue by using FNAC(Fine Niddle Aspiration Cytology)	159 (46.5)	183 (53.5)
Self Breast Examination(SBE)	93 (26.5)	258 (73.5)
Clinical Breast Examination by doctor (CBE)	210 (59.8)	141 (40.2)
Mammography	99 (28.2)	252 (71.8)
Ultra sound	12 (3.4)	339 (96.6)

Figure 4: Distribution of study participants by their proportion frequency of knowing breast cancer early detection measures, Kigali city, 2016 and percent may exceed 100% as multiple answers are possible



4.5. Knowledge of breast cancer screening practices and behaviour

Community health workers were asked if they practice early detection measures as a means of diagnosis of breast cancer. The findings indicate that roughly the majority 212 (59.9%) of the participants of the participants have ever practiced breast self examination. Of the participants who practiced SBE, 157 (50.5%) practiced SBE monthly, 69 (27%) started practicing SBE at age less than 25 Years. The most common reason for not practicing SBE mentioned by the study participants was not having breast problem 137(51.7%%) followed by not knowing how to do SBE 58 (22.5%). Thirty

one participants (12.7%) ever practiced clinical breast examination and 25.2% of the respondents practiced mammography yearly, 12.7% practiced once in two years and 4.2% once in five years.

Table 8: Knowledge and practices of breast cancer early detection measures

Breast cancer detection measures practices	Frequency	Percent (%)
Ever practiced Breast Self examination (BSE)		
Ever practiced BSE (n=354)	212	59.9
Once a month (n=311)	157	50.5
Once in three month (n=313)	12	3.8
More than once in a quarter of a year (n=310)	25	8.1
Not very often (n=306)	35	11.4
Never in a year (n=310)	91	29.4
Start age for breast self examination		
<25 of age	69	27
25-30	35	13.6
30-35	50	19.5
>35 of age	109	42.6
Ever practiced clinical breast examination (CBE) (n=245)		
Once	31	12.7
Between 1-2 times	18	7.3
Between 3-5 times	2	0.8
Never	176	71.8
Ever practiced mammography		
Yearly (n=274)	69	25.2
Once in two years (n=214)	27	12.7
Once in five years (n=230)	9	4.2

Regarding health seeking behaviour, 288 (87.1%) reported that if they noticed any change in their breast, they would consult the medical doctor, 34 (9.1%) said that they would consult the traditional doctor and 86 (23.1%) would go to a prayer house and 260 (70.5%) of respondents would agree to undergo mastectomy if deemed as necessary. Most 195 (56.59%) of the participants believed that breast cancer is not curable disease, and 125 (35.4%) believed that long time survival (>5year) after being diagnosed with breast cancer is rare. Participants were asked about their perceived risk of breast cancer. Accordingly, 138 (39.2%) replied that they don't know their perceived risk. While another 106 (30.1%) said that they are not at risk of developing breast cancer at all.

Table 9: Attitudes of Community health workers toward breast cancer

Questions	Responses	Frequencies	Percentages
If you develop breast cancer, what will be your attitude?			
a) You will be scared	Yes	288	75.6%
	No	81	21.3%
	Don't Know	12	3.1%
b) You will consult a doctor	Yes	324	87.1%
	No	47	12.6%
	Don't Know	1	0.3%
c) You will use a traditional medicine	Yes	34	9.1%
	No	334	89.8%
	Don't Know	4	1.1%
d) You will go to prayer house	Yes	86	23.1%
	No	282	75.8%
	Don't Know	4	1.1%
e) You will agree to perform Mastectomy (If necessary)	Yes	260	70.5%
	No	98	26.6%
	Don't Know	11	3.0%

4.6. Bivariate analysis of breast cancer risk factors knowledge and socio demographics

To assess the association between demographics and awareness of breast cancer risk factors, bivariate analysis was performed using chi-square test of independence. Awareness was considered at two levels, poor or good awareness level. The table below shows different socio demographics associated with breast cancer risk factor awareness.

Table 10: Association between socio-demographics and breast cancer risk factor awareness among female community health workers

Variables	Awareness of breast cancer risk factors	Chi-square	P-value
Residence			
Urban	9.4%		0.021*
Rural	0%		
Marital status			
Married	8.8%	0.443	0.506
Not Married	6.8		
Age group			
21-29	10.3%		
30-39	9.9%	4.172	0.243
40-49	3.5%		
50 and over	7.1%		
Education			
Primary Education	9.5%	2.505	0.286
Post primary & Vocational training	4.3%		
Secondary & Tertiary education	5.6%		
Occupation			
Farming	9.0%		
Trading/Entrepreneur	3.1%		
Arts & crafts	14.6%	7.279	0.091 *
Wage employee	0.0%		
Other (House wife, casual work)	13.6%		
Personal History of breast problem			
Yes	17.4%	10.928	0.001
No	5.5%		
First degree relatives history of breast cancer			
Yes	16.7		
No	7.4%	2.012	0.161*

*: Cross tabulation cell have expected counts less than 5 and Fisher's exact test was used

As reflected in the table above, the participants who had a breast problem history was more likely to have good awareness of breast cancer risk factors, $\chi^2=10.928$, $p=0.001$. The findings of Fisher's Exact Test indicated location of residence and occupation are related to breast cancer risk factors, $p=0.021$ and $\chi^2=7.279$, $p=0.091$ respectively. Demographic variables like marital status, age and educational level were not significantly associated with breast cancer risk factor knowledge.

4.7. Bivariate analysis of demographic variables and breast cancer screening practices

Awareness

Bivariate analysis was also performed to determine the association of demographics variable and breast cancer screening practices. Awareness was categorized into two levels namely poor and good knowledge as detailed in the methodology under measurement section.

Table 11: Knowledge of breast cancer early detection measures by socio demographics of respondents

Variables	Awareness of breast cancer early detection measures	Chi-square	P-value
Residence			
Urban	45.8%	0.425	0.515
Rural	40.5%		
Marital status			
Married	43.6%	0.102	0.749
Not Married	41.8%		
Age group			
21-29	41.7%	3.258	0.354
30-39	37.2%		
40-49	48.3%		
50 and over	46.5%		
Education			
Primary Education	48.3%	7.277	0.026
Post primary & Vocational training	41.2%		
Secondary & Tertiary education	28.8%		
Occupation			
Farming	41.3%	9.145	0.053*
Trading/Entrepreneur	52.8%		
Arts & crafts	44.7%		
Wage employee	0.0%		
Other (House wife, casual work)	31.6%		
Personal History of breast problem			
Yes	52.6	2.222	0.136
No	41.9%		
First degree relatives history of breast cancer			
Yes	33.3%	0.813	0.367
No	44.2%		

8: Cross tabulation cell have expected counts less than 5 and Fisher's Exact test was used

Participants who attended post primary education were more likely to have good awareness of breast cancer early detection measures $\chi^2=7.27$, $p=0.026$. Good awareness increased also with type occupation, the proportion of those who do business and small trade were higher than participants with other category of occupation, $\chi^2=9.145$, $p=0.053$. The remaining demographics namely age, marital status, residence, breast problem history and having family member with breast cancer were not found significantly associated with knowledge of breast cancer screening practices. Results for association between awareness of breast cancer early detection measures and demographic variables are shown above in table11.

4.8. Bivariate analysis of demographic characteristics and self breast examination practice

Table 12 shows the comparison of BSE practice with selected demographic variables. The participants from urban had the highest proportion (46.8%) of those who practice BSE than those who live in rural area (26.5%) with the statistically significant difference, $\chi^2=5.024$, $p=0.025$. Practice of BSE increased significantly with the level of education (54.2%) and among participants who attended post primary education were many than those who completed only primary education, $\chi^2=6.850$, $p=0.033$. Those who received breast cancer information from health facility (58.7%), had a significantly higher proportion of those who practice BSE than those who heard of breast cancer information from others sources, $\chi^2 = 6.643$, $p = 0.010$.

Table 12: Practice of self breast examination (SBE) by socio demographics of respondents

Variables	Practice of self breast examination	Chi-square	P-value
Residence			
Urban	46.8%	5.024	0.025
Rural	26.5%		
Marital status			
Married	45.0%	0.135	0.714
Not Married	42.9%		
Age group			
21-29	39.4%		
30-39	40.5%		
40-49	52.0%	3.396	0.335
50 and over	42.9%		
Education			

Primary Education	38.5%		
Post primary & Vocational training	54.2%	6.850	0.033
Secondary & Tertiary education	54.0		
Occupation			
Farming	49.3%	5.822	0.183*
Trading/Entrepreneur	34.6%		
Arts & crafts	38.7%		
Wage employee	0.0%		
Other (House wife, casual work)	35.7%		
Personal History of breast problem			
Yes	53.1%	1.874	0.171
No	42.5%		
First degree relatives history of breast cancer			
Yes	21.4%		
No	46.2%	3.304	0.069
Received information on breast cancer from health professional			
Yes	58.7%	6.643	0.010
No	40.7%		

*: Cross tabulation cell have expected counts less than 5 and Fisher's Exact Test were used

4.9. Factors associated with Breast Self Examination practice

A logistic regression analysis was performed to ascertain the effects of residence location, education categories, source of breast cancer awareness and breast cancer history on the likelihood that participants practice breast self examination. The logistic regression model was statistically significant, $\chi^2 (4) = 23.829$, $p < .0005$. The model explained 10.8% (Nagelkerke R square) of the variance in practicing self breast examination and correctly classified 62.1% of cases. The Wald criterion demonstrated indicated that respondents residing in urban area were 2.5 times more likely to practice breast self examination than those from rural area [OR=2.569, 5% CI=1.121-5.886]. Receiving breast cancer information from health professional or health worker was also associated with an increased likelihood practice self breast examination [OR=2.115, 95% CI=1.132-3.951], and respondents with primary education were likely to perform breast self examination, [OR=2.133, 95% CI=1.269-3.585] than the other category of education while having a relative with breast cancer history was found to be associated with breast self examination.

Table 13: Logistic regression analysis of factors associated with BSE practice

Variables	Breast Self Examination Practice	OR [95 % CI]	P-Value
Type of residence			
Urban	331	2.569 [1.121-5.886]	0.026
Rural	58		
Education categories			
Primary education	252	2.133 [1.269-3.585]	0.004
Secondary education&above	141		
Breast cancer awareness source			
Health workers/professional	80	2.115 [1.132-3.951]	0.019
Non health workers	276		
Family history of breast cancer			
Yes	21	0.263 [0.070-0.986]	0.048
No	367		

CHAPTER FIVE: DISCUSSION AND INTERPRETATION OF FINDINGS

Few studies conducted in Rwanda about breast cancer investigated clinical presentation of breast cancer among women and late presentation has been reported [95]. This late presentation could be related to the level of awareness about breast cancer, the risk factors and practice of the screening methods among Rwandan women. This cross sectional study attempted to assess breast cancer risk factors and screening practices among community health workers in Kigali. The study reveals low awareness regarding breast cancer risk factors and its screening practices among female community health workers in Kigali, Even though most of the respondents had heard of breast cancer, it was shocking that as many as 52 (13.4%) had not even heard of it. The finding of this study showed that respondents with good knowledge score for risk factors, early detections measures and warning signs of breast cancer was 7.7%, and 19.9% respectively.

5.1. Awareness of breast cancer risk factors

The findings in this study have shown that community health workers in Kigali had poor awareness of breast cancer risk factors. Overall, the awareness of breast cancer risk factors was poor (7.7%). This means in every 100 CHWs only seven were able to mention five breast risk factors out of ten breast cancer risk factors measured. The awareness of breast cancer risk factors among community health workers was found low and this finding is similar to that reported in other developing countries like Nigeria, Benin and South Africa [116, 117].

This study provided important data about the knowledge and awareness of risk factors and symptoms of breast cancer among female community health workers in Kigali. The most widely known risk factor among participants was smoking (45.9%) followed by positive family history of breast cancer (31.2%). The female community health workers in our study were very knowledgeable with several components of breast cancer risks. As expected, they were able to recognize most risk factors, 166 (45.9%) 113 (31.2%) and 74 (20.4%) recognized smoking, positive family history and not breastfeeding respectively as risk factors. A painless breast lump was most common reported early sign and symptom of breast cancer (87.7%) followed by breast pain or soreness (27.0%).

The low level of risk factor awareness among community health workers and other category of women in the developing countries could be related to limited exposure to breast cancer risk factors and screening awareness campaign and training on breast cancer primary prevention. Findings from other research indicate that despite the nursing or medical education background in the developed and developing countries, healthcare professionals including nurses do not have adequate knowledge about breast cancer risk factors and screening practices. [123].

While female community health workers are expected to act as role models for their fellow women in terms of educating the public about prevention from a number of diseases and; they had poor knowledge of breast cancer risk factors and practice of breast cancer screening. There is a need to conduct targeted training for community health workers concerning breast cancer education including early detection methods.

5.2. Factors associated with breast cancer risk factors knowledge

Good knowledge of breast cancer symptoms is very essential for early diagnosis and treatment of breast cancer. Only respondents who had a breast problem history were more likely to have good awareness of breast cancer risk factors, $\chi^2=10.928$, $p=0.001$. The results suggest that most of community health workers are in the same social-economic status and there is no remarkable distinction in their level of knowledge. The awareness about the early sign, symptoms and risk factors of breast cancer among female community health workers was not attributed to their demographic characteristics like age and educational level. In contrast to other study where age, educational level and social status significantly influenced breast cancer knowledge [124, 125] have demonstrated that older women have poor knowledge of key risk factors and symptoms of breast cancer.

5.3. Awareness of breast cancer early detection measures

Poor knowledge regarding breast cancer screening methods is responsible for late detection of the disease. The knowledge about diagnostic methods is highly beneficial to the participants as it assists women regarding when and how to perform breast cancer screening for early detection in order to reduce late presentation of the disease that might complicate treatment of breast cancer. The study found that the awareness of breast cancer early detection measures was low. (19.9%) of community health workers were aware of at two out of three screening practices. The awareness of breast cancer early detection methods among the CHWs was low. Similar findings were reported in other developing countries like Pakistan, Jordan and Nigeria, [126, 127]. CBE was the most common means of detecting breast cancer, reported by 210 (59.8%) of the participants, followed by biopsy (46.5%) while Ultra sound was least know with (3.4%). Surprisingly the BSE was less mentioned in contrast to other studies where it most known method of screening (26.5%).

Other studies have also shown that generally awareness of breast cancer early detection methods was low, and the most common known method was BSE. Mammography, Ultrasound and CBE were not commonly known and was attributed to lack or absence of such services in their respective countries [124,125].

5.4. Factors associated with breast cancer early detection measures awareness

Female community health workers who attended post primary education were more likely to have good awareness of breast cancer early detection measures $\chi^2=7.27$, $p=0.026$. Good awareness increased also with type occupation as the proportion of those who do business and small trade were higher than participants within other category of occupation, $\chi^2=9.204$, $p=0.056$. The findings show that good awareness level of breast cancer early detection measures tend to increase with the level of education and occupation of participants. From the findings, awareness of breast cancer early detection measures showed a strong association with having a positive family history of breast cancer and having breast problem. The results corroborates with other studies related to awareness which indicated that family history was associated with general breast cancer awareness. Profession, age, and family history significantly influenced breast cancer screening awareness [126,127].

5.5. Practice of early detection measures and associated factors

This study investigated also the knowledge and practice of Breast self examination (BSE) among the study participants. BSE is one of the important steps for identifying breast tumors at an early stage [78] and thus regular practice of BSE could protect women from severe morbidity and mortality due to breast cancer. This study focused more on breast awareness and breast self examination (BSE) because it is the most easily and readily accessible method in developing countries. Second, it was the most common reported screening method with respondents. However, other screening methods were explored so as to understand at what extend, study participants are aware of them.

The findings revealed that 50.5% of respondents have ever performed BSE and 27% started early at the age of less than 25 years old. 53.6% of the participants did not know the correct procedure to perform BSE, whereas only 16.7% knew that BSE should be performed monthly. Furthermore, Thirty one participants (12.7%) ever practiced clinical breast examination and 25.2% of the respondents practiced mammography yearly, 12.7% practiced once in two years and 4.2% once in five years. Similar studies in developing countries indicate poor CBE and mammography practices. Another study reported that 34.3% of Nurses in Lagos had had a CBE although majority of their study participants did not know the correct time or technique for carrying out the procedure. [125]. A study conducted in Malaysia found that the low rates of BSE, CBE and mammography were also of concern amongst Malaysian women and suggested that increased awareness and subsidized mammography be given to the general population.[128]

Another study conducted in Nigeria [129] on Attitude, knowledge and practice of breast self-examination (BSE) in port Harcourt, Nigeria and found that 85.5% of the respondent had heard of Breast self examination but 39.0% practiced BSE only occasionally. Similar findings were reported in previous studies conducted in suburban and urban communities of Nigeria where it was reported that higher percentages of population practice BSE. However, they do not practice BSE according to the classic technique [129, 130].

The findings also revealed that the higher the level of education, the more the likelihood that a woman would practice BSE and easily utilize other screening methods if the need arises. This corroborated the studies cited by Maxwell et al. [131] For example; the level of education of a woman is likely to influence a woman's adherence to mammography screening. Also, a woman with

higher level of education is likely to report promptly to the hospital for proper examination if any symptoms suggestive of cancer are seen or felt. The finding was however in contrast to study by Sensiba and Stewart (1995) reporting that educated women often forgets to practice BSE. [132]

Findings indicated that residence type was strongly associated with BSE practice [OR=2.569, 95% CI=1.121-5.886]. Receiving breast cancer information from health professional or health worker was also associated with an increased likelihood of practicing breast self examination [OR=2.115, 95% CI=1.132-3.951], and respondents with post primary education were likely to perform breast self examination, [OR=2.133, 95% CI=1.269-3.585] than the other category of education while having a relative with breast cancer history was found also to be associated with breast self examination.

5.5. Strengths and Limitation of the study

Strengths

The study is the first of its kind in Rwanda and identifies the level of awareness about breast cancer risk factors and screening practices among community health workers. Others studies can use it as baseline for further studies or breast cancer interventions programming.

Limitations

Since the sample of this study included community health workers residing and living in Kigali city, the findings of the study cannot be generalized to the larger population or other group of community health workers in Rwanda.

There was no international standardized methods and questionnaire for measuring breast cancer knowledge available and this may serve as a limitation in comparing our findings with other studies. The knowledge questions were based on available information from existing literatures. Different scholars have used different measurement or categorization scale of awareness level and hence our scale of measurement could be varying since there was no standard scale of measure.

There was also a limitation of small numbers in some cells of sub categories during bivariate chi-square analysis resulting into less significant results and thus being not able to assess the association. This is because some variables had less than five observations in a cell.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

The study revealed that the awareness level of majority of the respondents on breast cancer risk factors and screening practices were low, thus the practice of BSE was also inadequate. The awareness of breast cancer risk factors among community health workers residing in was low (7.7%). Demographic and individual variables such as having a history of breast problem were found significantly associated with breast risk factors awareness. The awareness of breast cancer early detection measures was also found low (19.9%), the awareness was found influenced by occupation and educational level. A good number of participants knew about the BSE but they lack knowledge regarding frequency and appropriate time to practice BSE. Thus, more educational programs could be designed to provide comprehensive information of breast cancer and BSE to improve women's knowledge and awareness which can help in the early detection and reporting of breast cancer for the better treatment.

6.1 Implications for health education and future research

The findings of the study showed that a greater proportion of community health workers in Kigali had low awareness of breast cancer risk factors and screening methods. This therefore emphasized the need to design breast cancer awareness campaign and training especially for community health workers to educate women in the rural communities on breast cancer risk factors and screening methods. The government through health workers should therefore put much effort in educating the masses and teaching them about breast cancer screening methods.

- There is need for similar studies among community health workers in other parts of Rwanda, and population studies could provide evidence that will facilitate a better understanding of the level of awareness of breast cancer for successful implementation of screening programs awareness campaigns.
- There is need to create awareness about the importance of breast cancer screening practices among women so as to improve their screening practices to detect breast cancer at an early stage

- Screening methods for breast cancer should be included in the package of community health workers and other health professionals so as to empower them to take up the challenge of breast cancer early detection
- Similar studies should be done among other categories of profession and women preferably in a rural setting

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Appendix I: Participants consent form

CONSENT FORM

You have been asked to be interviewed for a study on “*Awareness of breast cancer risk factors and screening practices among female community health workers in Rwanda*”.

Your participation will consist of one interview lasting between 20 minutes and 40 minutes. You are free to decline to answer any question. The information collected in this study will be kept in confidentiality and used for Masters ‘degree dissertation purposes only.

The aim of this study is to assess awareness of breast cancer risk factors and screening practices among female community health workers and the findings of the study will help in effectively planning targeted campaigns so as to raise awareness on breast cancer and enhance prevention measures. There may be no other benefits to you personally. However, there is a strong possibility that you will be contributing to the well being of the Rwandan women yourself included.

The participation in this study is voluntary. You are free to withdraw from the study at any time without any consequences. In case the findings from this study are published. We will keep your personal information and responses confidential and password protected.

No other risks to you are foreseen from participation in this study.

If you have questions about this study, email the Principal Investigator Felix MULINDANGABO at mufely@gmail.com or call (+250) 788 823 130. Any questions about your rights as a research subject should be directed toward the current Chairperson of the University of Rwanda, College of Medicine and Health Sciences, Institutional Review Board, on Telephone number at 0788 490 522 or 0783 340 040.

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I have read and I understand the above. I have been offered a copy of this informed consent form.

Participant’s Signature: _____ Date: _____

Participant's Printed Name: _____

I have explained and defined in detail the research procedure in which the participant has agreed to participate, and have offered the participant a copy of this informed consent form

Investigator's (or Research Assistant’s) Signature: _____ Date: _____

Investigator's (or Research Assistant’s) Printed Name: _____

Icyemezo cyo kwiyezwa ku bushake kugira uruhare mu bushakashatsi (Kinyarwanda)
University of Rwanda
College of Medicine and Health Sciences/School of Public Health

**Ubumenyi ku bijyanye n'indwara ya kanseri y'ibere ndetse n'uburyo bwo kuyisuzuma mu
bajyanama b'ubuzima b'igitsina gore.**

Twagusabaga ko twagirana ibiganiro mu rwego rw'ubushakashatsi k'ubumenyi ku bijyanye n'indwara ya kanseri y'ibere ndetse n'uburyo bwo kuyisuzuma mu bajyanama b'ubuzima b'igitsina gore.

Uruhare rwawe muri ubu bushakashatsi rushingiye ku kiganiro turi bugirane. Iki kiganiro kiramara hagati y'iminota 20 na 40. Ufite uburenganzira busesuye bwo kudasubiza ikibazo iki n'iki waba wumva kikubangamiye. Amakuru azava muri ubu bushakashatsi azafatwa nk'ibanga kandi azakoreshwa gusa ku mpamvu z'ubushakashatsi.

Ikigamijwe muri ubu bushakashatsi ni ugusobanukirwa neza ubumenyi abantu bo mu kicio cyawe bafite ku ndwara ya kanseri y'ibere ndetse n'uburyo bwo kuyisuzuma. Ni muri urwo rwego ubu bushakashatsi bushobora kugira akamaro mu gufasha inzego zitandukanye kumenya ingamba zafatwa mu kongera ubumenyi no kwirinda indwara ya kanseri y'ibere. Byashoboka kandi ko nta nyungu zindi wakuramo ku giti cyawe ariko mu kugira uruhari muri ubu bushakashatsi byagira uruhari muguteza imbere imibereho y'abagore muri rusange nawe urimo.

Kugira uruhare muri ubu bushakashatsi ni ubushake bwawe. Ufite uburenganzira busesuye bwo kwanga cyangwa kubuvamo igihe icyo ari cyo cyose. Mu gihe bizaba ngombwa ko ibyo wadusubije bishyirwa mu byavuye mu bushakashatsi buzatangazwa, tuzakoresha amazina y'amahimbano, kandi amakuru akwerekeyeho n'ibyo wadusubije tuzabibika mu ibanga rikomeye.

Nta zindi ngaruka duteganya ko zakubaho ziturutse ku ruhare rwawe muri ubu bushakashatsi.

Niba hari ibibazo ufite kuri ubu bushakashatsi, wakwandikira umushakashatsi mukuru witwa Felix MULINDANGABO kuri mufely@gmail.com, cyangwa ukamuterefona kuri (+250) 788 823 130. Ku bibazo bijyanye n'uburenganzira bwawe nk'umuntu ugira uruhare mu bushakashatsi ubushakashatsi, wahamagara ukuriye akanama kagenzura imikorere myiza y'ubushakashatsi mu ishuri ry'Ubuzima riri muri Urwanda, ukoreshe telefoni 0788 490 522 cyangwa 0783 340 040.

Nasomye kandi nsobanukiwe neza ibyavuzwe haruguru. Nahawe kandi kopi y'iki cyemezo cyo kwiyezwa ku bushake kugira uruhari mu bushakashatsi.

Isinya y'ukorerwaho ubushakashatsi: _____ Itariki: _____
Amazina y'ukorerwaho ubushakashatsi: _____

Nasobanuye kandi ngaragaza ku buryo bunonosoye imigendekere y'ubushakashatsi ukorerwaho ubushakashatsi yemeye kugiramo uruhare. Namuhaye kandi kopi y'iki cyemezo cyo kwiyezwa ku bushake kugira uruhari mu bushakashatsi.

Sinya y'ukora ubushakashatsi: _____ Itariki : _____
Amazina y'ukora ubushakashatsi: _____

Appendix II: Questionnaire

APPENDIX I: Questionnaire

Thesis Title: *Breast cancer risk factors awareness and screening Practices among female community health workers in Rwanda*

Breast Cancer is a global public health problem. To ensure primary prevention and treatment population based screening program as well as breast cancer awareness is necessary. To assess\breast cancer awareness and screening practices regarding some information is required from you. Your response will contribute a big effort to conduct this study. Your participation would be kept confidential.

Socio-demographic characteristics			
District	District of respondents	Gasabo1 Kicukiro.....2 Nyarugenge.....3	Circle the number corresponding to the answer
DEM01	Type of residence of the respondents	Urban...1 Rural....2	
DEM02	How old are you now?	[][]	
DEM03	What is your current marital status?	Married (Monogamy)..... 1 Married (Polygamy)..... 2 Single..... 3 Widowed /Separated / Divorced..... 4	
DEM04	Have you ever breastfed?	Yes..... 0 No.....1	
DEM05	Have you ever been at school?	Yes..... 0 No.....1	
DEM06	What is the highest level of education you have attained/current level of education?	Primary1 3 years post primary education.....2 Post primary vocational training3 Secondary school.....4	

		Higher education 5	
DEM07	Are you able to read a newspaper/magazine or a letter?	Yes..... 1 No.....0	
DEM08	What is your main occupation	1 = Agricultural worker/Livestock keeper 2= small trade 3 = Arts & crafts 4 = Public, private, NGOs Employee 5= Others (specify.....)	
DEM09	Do you have an income generating activity?	Yes 1 No0	IF No, Skip to EXP11
DEM10	What is your main source of income?	family 1 farm work 2 private work 3 Public work 4 Domestic work 5 Other _____ 88	

	Exposure to breast cancer information		
EXP11	Have you heard of breast cancer	Yes..... 1 No.....0	IF No, Skip to EXP13
EXP12	Where have you got information on breast cancer	Hospital/Health center.....1 Community health workers.....2 Work place.....3 School.....4 Friend.....5	

		Media.....6	
		Community meeting/conversation..7	
EXP13	Have you any family history (1st degree relation*) of breast cancer	Yes..... 1 No.....0	
EXP14	Have you had any breast problem	Yes..... 1 No.....0	

KNOWLEDGE OF BREAST CANCER RISK FACTOR AND SCREENING PRACTICES					
	QUESTIONS	Responses			Skip
KAP15	Please identify the factors which you think is a potential risk factors for developing breast cancer. (Don't read answers to the respondents) More than one answer is acceptable)	a. Increasing age b. Positive family history c. High fat diet d. Smoking e. Working class women f. Alcohol consumption g. First child at late age h. Early onset of menarche i. Late menopause j. Stress k. Larger breast l. Use of oral contraceptive pills m. Physical inactivity n. Woman who do not breastfeed o. Obesity p. Radiation exposure (Specify)_____	Yes 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	No 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	

KAP20	Could you describe the steps of performing self breast examination (SBE)	a) Begin by looking at your breasts in the mirror with your shoulders straight and your arms on your hips. b) Now, raise your arms and look for the same changes. c) While you're at the mirror, look for any signs of fluid coming out of one or both nipples (this could be a watery, milky, or yellow fluid or blood). d) Next, feel your breasts while lying down, using your right hand to feel your left breast and then your left hand to feel your right breast e) Finally, feel your breasts while you are standing or sitting	
KAP21	Do you know how often SBE should be done(Tick the answer you think right)	Daily.....1 Weekly.....2 Monthly.....3 Unidentified.....4 Don't Know.....5	
KAP22	Do you know how often CBE should be done. until a women should reach 40years. (Tick the answer you think right)	Once in a year.....1 Once in two year.....2 Once in three year.....3 Don't know.....4	
KAP23	Do you know recommended age for mammography examination to start?	a)At the age of 30 b)At 35 c)at 40 d)at 45 of age e)Don't know	
KAP24	If you develop breast cancer what will be your attitude.(Yes/No, Don't know)	You will be scared Yes.....1 No.....0 Don't know....88	

		You will consult to a doctor. Yes.....1 No.....0 Don't know....88	
		You will use traditional medicine Yes.....1 No.....0 Don't know....88	
		You will go to prayer house Yes.....1 No.....0 Don't know....88	
		You will agree to perform Mastectomy (If necessary) Yes.....1 No.....0 Don't know....88	
KAP25	If you develop breast lump how fast you will go to see a doctor	Within one week Within 1 months Within 1-3 month Not bother at all	
KAP26	Will you allow male doctor to examine your breast	Yes1 No 0	
KAP27	Do you believe that breast cancer occur more commonly in old women.	Yes1 No 0	
KAP28	Please give your perceived risk for developing breast cancer (Tick only one answer)	Not at risk Lower risk Medium risk Higher risk Don't know	

KAP29	Do you think you have any risk factors.(Please Tick only one answer)	None 1 risk factors 2 risk factors 3 risk factors >3 risk factors	
KAP30	Do you think breast cancer is a curable disease	Yes1 No 0	
KAP31	Do you think Long time survival (more than five year) is rare (due to breast cancer)	Yes1 No 0	
KAP32	Do you practice BSE(Breast Self Examination)	Yes1 No 0	
KAP33	If Yes, then how often you practice Breast self Examination	Once in a month Once in 3 month More than once in quarter of a year Not very often Never in a year	
KAP34	At what age you started practicing BSE (Breast Self Examination)	<25 of age 25-30 30-35 >35 of age	

KAP35	If you don't practice SBE regularly then what are the reasons (Skip those who practice regularly, once in a month) one can answer more than one	a. I don't have breast problem. b. I don't think I should c. I don't feel comfortable doing this d. I do not know how to do that e. Carelessness f. Too frequent to practice. g. I don't think it is necessary. h. Unsure about its benefit Or, specify other reason.....	Yes 1 1 1 1 1 1 1 1	No 0 0 0 0 0 0 0 0
KAP36	Have you ever done your breast examination by any Doctor (Clinical Breast examination) (If Yes) Frequency of examination	Once 1-3times 3-5 times	I	
KAP37	(If not,) Why do you reluctant to participate in CBE(Clinical Breast Examination)	a. Concern about extra money b. Concern about extra time c. Fear of out come d. Too young to participate e. No sign symptom of breast cancer f. No one recommended g. Unsure about the benefit. h. If other then specify.....	Yes 1 1 1 1 1 1 1	No 0 0 0 0 0 0 0
KAP38_A	Have you ever heard of mammography?	Yes.....1 No.....0	IF No, Skip to KAP39	
KAP38	Have you ever done breast cancer screening by mammography	a. Yearly b. Once in two years c. Once in five years		

KAP39	If you don't go for mammography screening , then what are the reasons (Skip those who does it regularly, once in a year)	a. Concern about extra money b. Concern about extra time c. Fear of out come d. Too young to participate e. No sign symptom of breast cancer f. No one recommended g. Unsure about the benefit. h. If other then specify.....	
KAP40	Do you know various methods of treatment of breast cancer?	a. Chemotherapy b. Conservative surgery c. Mastectomy d. Radiotherapy	

Thanks for your Participation!

Appendix III: Ethical Clearance Letter



CMHS INSTITUTIONAL REVIEW BOARD (IRB)

Kigali, 12/04/2016

Felix MULINDANGABO

Approval Notice: No 131 /CMHS IRB/2016

Your Project title “Awareness of breast cancer risk factors and screening practices among female community health workers in Kigali, Rwanda: a Cross sectional study” has been evaluated by CMHS Institutional Review Board.

Name of Members	Institute	Involved in the decision		
		Yes	No (Reason)	
			Absent	Withdrawn from the proceeding
Prof Kato J. Njunwa	UR-CMHS	X		
Prof Jean Bosco Gahutu	UR-CMHS		X	
Dr Brenda Asimwe-Kateera	UR-CMHS	X		
Prof Ntaganira Joseph	UR-CMHS		X	
Dr Tumusiime K. David	UR-CMHS	X		
Dr Kayonga N. Egide	UR-CMHS		X	
Mr Kanyoni Maurice	UR-CMHS	X		
Prof Munyanshongore Cyprien	UR-CMHS	X		
Mrs Ruzindana Landrine	Kicukiro district		X	
Dr Gishoma Darius	UR-CMHS	X		
Dr Donatilla Mukamana	UR-CMHS		X	
Prof Kyamanywa Patrick	UR-CMHS		X	
Prof Condo Umutesi Jeannine	UR-CMHS		X	
Dr Nyirazinyoye Laetitia	UR-CMHS		X	
Dr Nkeramihigo Emmanuel	UR-CMHS		X	
Sr Maliboli Marie Josee	CHUK	X		
Dr Mudenge Charles	Centre Psycho-Social	X		

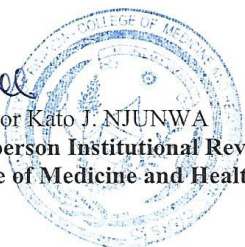
After reviewing your protocol during the IRB meeting of where quorum was met and revisions made on the advice of the CMHS IRB submitted on 22nd March 2016, **Approval letter has been granted to your study.**

Please note that approval of the protocol and consent form is valid for **12 months**. You are responsible for fulfilling the following requirements:

1. Changes, amendments, and addenda to the protocol or consent form must be submitted to the committee for review and approval, prior to activation of the changes.
2. Only approved consent forms are to be used in the enrolment of participants.
3. All consent forms signed by subjects should be retained on file. The IRB may conduct audits of all study records, and consent documentation may be part of such audits.
4. A continuing review application must be submitted to the IRB in a timely fashion and before expiry of this approval
5. Failure to submit a continuing review application will result in termination of the study
6. Notify the IRB committee once the study is finished

Sincerely,

Date of Approval: The 12th April 2016
Expiration date: The 12th April 2017



Professor Kato J. NJUNWA
Chairperson Institutional Review Board,
College of Medicine and Health Sciences, UR

Cc:

- Principal College of Medicine and Health Sciences, UR
- University Director of Research and Postgraduate studies, UR